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Circular No. 825

Farm Land Development: Present and Future

By Clearing, Drainage, and Irrigation

By

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Agricultural Economists, Bureau of Agricultural Economics

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PREFACE

Many people looking for farms since the war have found that opportunities for obtaining good farm land are limited. A great many prospective buyers are not able to pay for fully developed farms at current prices. Many believe that good returns can be had by buying undeveloped land and improving it for agriculture. They think the undeveloped land they see about the country is cheaper and offers better prospects. So they ask, "What about new farm land development? Are any new areas being developed? If so, how much and by whom, and what kind of land it is? What will development cost?"

These are reasonable questions. People with considerable capital to spend also are interested in areas where the land is new. Some of the larger, new land developments under way and proposed are being made by large farmers, businessmen, and land companies. Apparently, this work has a fascination for the businessman and professional man as well as for farmers.

To provide information on what is happening in land development and the general prospects, this report tells something about new land areas brought into cultivation and pasture recently, and includes estimates of probable land development in the next few years. Even though choice of land is now restricted because most areas are already occupied, there are still some possibilities for creating farms from new land.

No attempt has been made to specify exact tracts of new land that might be bought for farming, as such information is not available except locally. Even the most detailed surveys, if taken alone, are not sufficient basis for selection of land. There is no substitute for careful personal inspection and responsible local advice. Most areas capable of development by individual or community effort are now being used for agriculture, or are held for more intensive uses. What remains will require extensive area-wide public assistance from the State or Federal Government, in addition to what the individual can accomplish. The amount of such aid—particularly in the way of public irrigation, drainage, and flood-control works—will largely determine how much new land can be put into farms in coming years. The degree of public aid that will be offered to land developers will depend on many circumstances, one of which is the demand for products of new farm land.

No single source of information was relied upon in preparing this report. Current information from Department of Agriculture surveys and technical workers and from publications of other Federal departments, agricultural colleges and experiment stations, and nongovernmental agencies have been widely drawn upon.

Several individual members of the Bureau of Agricultural Economics and of State agricultural experiment stations contributed to this study. Many other people furnished data or were consulted directly, including a number of residents in different parts of the country.

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Farm Land Development: Present and Future By Clearing, Drainage, and Irrigation

By H. H. Wooten and Margaret R. Purcell

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INTRODUCTION

Although large-scale pioneering and homesteading in new areas is over, new land development is by no means of the past. It goes on continuously, the rate of development fluctuating with economic conditions.[1]

For the most part, current development is unspectacular. Much of it is carried out on established farms. A wet spot is drained, part of a woodlot is cleared for pasture, stones and brush are removed, or a block of dry land is plowed and irrigated. At the same time, elsewhere some developed farm land is turned back to pasture or woods, or goes out of farm production altogether as relative income varies, or as alternative employment offers. In unusual times, as after wars or during depressions, there is sometimes a flurry of extraordinary development, some on entirely new land, some on land previously farmed.

Most land suitable for farming in the United States is in the form of established farms. This is especially true in the Corn Belt and other good farming areas. One of the pressing problems of prospective farmers of undeveloped land is to obtain the funds with which to improve and operate the land that is available. It should be remembered that it is easier to get money for buying and improving a developed or partly developed farm than for buying undeveloped land. From the limited extent of potential agricultural acreage that remains, a considerable number of new farms will be created, however, and many acres will be improved on existing farms through irrigation, drainage, or clearing, in the next few years. Such development will be relatively slow and costly. In some instances, the cost and nature of the development are such that substantial public aid will be required before it is undertaken.

Factors Affecting New Land Development

Reality today seems to be dimming the notion that developing a farm from new land is a quick and profitable way to start farming. In the past, when costs and living standards were lower, a new farmer could take his time in making a farm. Enough land was usually cleared immediately to provide subsistence for a year or two. After that operations went on year after year in an unspectacular, laborious way. With the cost of land low, with taxes few and low, and living standards modest, a farmer and his family could carve out a few acres at a time until the farm was to their liking. Today a farmer needs a paying farm much more quickly. Not only are initial costs of land greater, but interest and taxes, which go on regardless of farm returns, are higher. Family labor is now often insufficient to prepare a farm fast enough to maintain present-day living standards and to pay fixed and operating expenses. Consequently, labor and machinery must often be hired to do in one year, or even in a few months, what the great-grandparents took years, sometimes a lifetime, to accomplish.

Land development, moreover, requires much labor, time, and material today, because only the less workable and more difficult lands remain available. It also requires a considerable investment in money. Large private and public improvements—such as roads, bridges, drainage and irrigation ditches, reservoirs, dikes, and levees as well as market facilities—often are necessary. Frequently, labor and capital can earn more on existing farms or in alternative fields of nonfarm employment.

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[1] The term "new farm land development," as used in this report, includes the preparation of unimproved, or presently nonarable, land for crops and seeded pastures by such measures as clearing woodland and brush, removing stumps and stones, installation of drainage ditches and tile lines, and leveling, ditching, or terracing unimproved land for irrigation.

Certain areas that are not well suited to farming are zoned against year-round residence. Some land, held in large tracts by lumber and mining companies and others, is seldom for sale in typical farm-sized units. Title to some privately and publicly held land is obscure so the land fails to fall into the most productive hands. In some such areas squatters occupy land without permission and contribute to the problems of management and development.

Much land is so divided, or cut up into small checkerboard tracts, that suitable contiguous tracts large enough for efficient farms are difficult and costly to assemble into farm units. Subdivision by inheritance, real estate development sales, and public grants of specified or alternate sections for schools, railroads, and other purposes, all have contributed to checkerboard and strip patterns of landownership which affect the use.

Other areas are permanently devoted to necessary public use as forests, watershed protection areas, floodways, parks, and other public use areas. They are not for sale. Suitable public domain land has mostly been taken up, and much of what is left is too dry, rough, or high in elevation, or too poor, for farming, so it is no longer open to homesteading except with restrictions. Many privately owned land areas are likewise too dry, rough, wet, or too inaccessible to appeal to even pioneer-spirited persons.

To those who think they see a fair farm income in every undeveloped acre, it should be said that not all unused land could or should be developed for farming. There may be considerable areas of undeveloped land that is physically suitable for agricultural production, but economically it may not be sound to develop all of it now or in the foreseeable future. Many factors determine which lands will be made into farms. Among them are the needs for food and fiber, availability of markets, alternative opportunities for employment, costs of development, need for enlargement of existing farms, productivity of new land in relation to developed land, probability of public assistance in development, and the possibility that public investment could be made elsewhere with greater benefit.

Clearly, it is not enough that the new land will grow crops and pasture. It must grow crops and pasture in competition with developed land. It must be located where marketing is feasible. Markets and market facilities are an essential part of successful new land developments. Many communities of new farms have failed as they found that they had no facilities for preparing and selling the truck or other products they produced in good quantities. This is true of some areas in the South which tried to break away from the one-crop system.

POTENTIAL CROPLAND

The arable area of farm land might be increased substantially in several regions from the productive, unimproved woodland, range land, and other land partly in farms and partly outside farms. This could be accomplished when increased demand justifies bringing it into production by clearing, draining, irrigation, and other improvements. There are probably more than 80 million acres of land which, when drained, irrigated, or cleared, would be more productive for crops than some cropland now in cultivation.[2]

Of this total, a considerable area would be fairly well adapted to cultivation by clearing alone, without drainage or irrigation, although for much of the land in the South and the Mississippi Valley draining would be requisite.

The United States Department of Agriculture has estimated that altogether some 40 million acres of intrinsically fair to good undeveloped land can be prepared for farming at costs comparable to those of the recent past (*48, p. 35*).[3] Of this total, some 20 million acres which need clearing and drainage, scattered over the country, could be made into arable farm land by measures that seem feasible; 5 million acres of fertile Mississippi River Delta land can be made available by clearing, drainage, and additional protection from floods; and it is estimated that possibly as much as 15 to 20 million acres can ultimately be reclaimed through irrigation and related improvement.

These figures represent the estimated limits of physical development for perhaps 25 years or more. Under conditions likely to occur in the foreseeable future, not more than half of this further potential for irrigation and drainage will probably be developed. Even if economic conditions warrant, development probably could not be pushed to such a point for some years because of the time, materials, machinery, and manpower required for providing necessary public services and for improving the land. Some of this land is needed to replace eroded and depleted tracts.

Soil and conservation surveys indicate that altogether there are many areas of woodland that are fairly well adapted to crop production from a physical standpoint, if cleared alone or if cleared and drained, although the quality generally is lower than present cropland. A large part of this land is in farms. A considerable part is now grazed. Much woodland in farms that does not require drainage or irrigation could be developed at moderate cost. The amount, species, and size of the forest growth on this land will affect the costs of clearing. The method of clearing used may appreciably affect the cost of bringing this land into cultivation.

The bulk of the unimproved land most suitable for development in the next few years is in areas where development projects—such as drainage, flood control, and irrigation—are partly completed, or are under construction, or are authorized. Part of the irrigation, drainage, and flood-control development now under way or planned is primarily to benefit existing farms and ranches, although areas of undeveloped land will also be benefited. Much of the development throughout the country for drainage and clearing cut-over tracts, however, is primarily a matter for local districts and for community groups and individual initiative, as there is no special Government program for it at present.

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[2] The Soil Conservation Service, in its classification of the lands of the country in 1945 according to use capability, classed approximately 85 million acres of unimproved land as suitable for regular cultivation under good practices. This includes the land which needs drainage, irrigation, and clearing, as well as some additional acreages of grazing lands suitable for cultivation under good farming practices. (*73, p. 5*)

[3] Italic numbers in parentheses refer to literature cited, p. 63.

Drainable Land and Woodland Adapted to Farming

The need for improved drainage of farm land is widespread. Exclusive of land in organized drainage enterprises there are, in humid sections, over 97 million acres of wet, swamp, and overflow lands. The drainage subcommittee of the American Society of Agricultural Engineers, in 1946, estimated that 20 million acres of this land can be drained by community drains at reasonable cost and that the land is fertile enough to support and maintain an economic agricultural development (*1, pp. 5–6*). This leaves 77 million acres of wet land which, under existing conditions, is more suitable to use for wildlife, forest, and other uses, than for cultivated crops. Of the land adapted to farming, 6.4 million acres are cultivated or partly cultivated and are in need of improved outlet drainage, and 13.6 million acres are undeveloped land. Organization of drainage districts or some type of community enterprise probably would be necessary to handle area-wide aspects of development.

Summarizing the extent of drainage needs, the report of the drainage committee states that 29 million acres partly improved in organized drainage enterprises and 8 million acres of irrigated land require improved drainage. Thus, a total of 57 million acres should have better main outlet drainage. Most of the land outside drainage districts and part of that inside requires clearing. Land in need of outlet drains generally needs individual farm drainage in addition to that provided by the main ditch and community tile lines.

A 1948 estimate of the Soil Conservation Service shows that approximately 21 million acres of undeveloped land are physically feasible to drain and bring into cultivation. Recent resurveys in Texas and a few other States indicate that somewhat larger acreages can be classified as suitable for development by drainage than estimated earlier. The area of fertile, undeveloped land classified by States as suitable for drainage are given in table 1. This estimate includes undeveloped land both in organized drainage enterprises as well as land outside them. The largest area of undeveloped land feasible to drain is in Texas along the Gulf coast. The Southeastern and Mississippi Delta States have large areas. Large areas also are located in North Carolina, Virginia, and the Lake States.

On much of this land clearing trees and stumps is usually necessary. The acreage estimated feasible to drain and develop is only slightly over 3 percent of the forest area as of 1945. It is not known exactly to what extent any of this land now is covered with forests of commercial quality, but, doubtless a considerable part is cut-over land, or is in cover types that produce chiefly fuel wood, or is coastal and other wet areas largely nonforested. Even where new land development for farming might involve clearing commercial forest, or draining other areas of undeveloped land, there can be no sound objection to putting the relatively small areas of land best adapted to, and needed for, food crops into that use.

TABLE 1.—*Estimated acreage of fertile undeveloped land physically feasible to provide with drainage, selected humid sections of the United States, 1948* [1]

Region and State	Estimated acreage
	1,000 acres
Northeast:	
Maine	64
Vermont	18
Connecticut	22
Rhode Island	4
New York	100
New Jersey	60
New Hampshire	18
Pennsylvania	90
Massachusetts	19
Maryland	63
Delaware	34
Total	492
Appalachian:	
North Carolina	1, 157
Virginia	514
West Virginia	15
Kentucky	170
Tennessee	242
Total	2, 098
Southeast:	
Alabama	683
Georgia	1, 721
South Carolina	966
Florida	1, 970
Total	5, 340
South Plains:	
Oklahoma	35
Texas	3, 928
Total	3, 963
Mississippi River Delta:	
Arkansas	1, 865
Louisiana	2, 769
Mississippi	1, 272
Total	5, 906
North Central:	
Ohio	95
Indiana	135
Illinois	69
Missouri	323
Iowa	56
Total	678
Lake States:	
Michigan	690
Minnesota	874
Wisconsin	316
Total	1, 880
North Plains:	
North Dakota	29
South Dakota	88
Nebraska	22
Kansas	30
Total	169
Pacific Northwest:	
Washington	137
Oregon	61
Total	198
Grand total [2]	20, 724

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[1] Estimates from surveys of the Soil Conservation Service. For earlier data refer to hearings before a subcommittee of the Senate Committee on Agriculture and Forestry, 78th Cong., 2d sess., on S. 1289, June 5 and 6, 1944 (*56, p. 7*).

[2] These areas of wet land are mostly in the humid eastern part of United States, east of the Great Plains. There are small coastal areas in the Pacific Northwest. The acreage listed here does not include about 80 million acres of wet land largely outside drainage enterprises suited for wildlife, recreational uses, and the growth of timber.

In addition to land which requires outlet drainage, considerable acreages can be improved by farm drains that empty into natural streams. Numerous belts of land suitable for cultivation or for pasture are located along hill and mountain streams where good land is scarce but where farm drainage and clearing are feasible ways of adding to the productive farm acreage.

Drainage outlets for several new areas surveyed in 1946 were estimated by the Soil Conservation Service to cost on the average from $15 to $40 per acre. Costs of draining undeveloped land inside districts were estimated at $5 to $30 per acre. In addition, there would be costs for individual field drainage, roads, and bridges, and frequently for clearing of trees and stumps. If land clearing follows the usual practice in many cut-over and brushland areas of the South and only trees and brush are cut, piled, and burned—without taking out the stumps—clearing costs average about $25 an acre. But the cost of complete clearing and stumping jobs frequently amounts to $50 to $75 an acre or more. Costs of clearing in heavy timber in the Pacific Northwest and some other regions run considerably higher. These estimates probably are conservative as they reflect conditions in a lower price level than prevailed in 1948.

ARABLE PASTURE AND RANGE

Pasture land to the extent of 100 million acres or more is estimated as plowable. About half of this is rotation pasture and is used interchangeably with other cropland in long-time cropping programs. The remainder possibly could be used for crops if urgently needed, but this would require a drastic reorganization in present systems of farming and additional erosion-control measures on steep land. Practically all pasture and range land is in productive use and contributes substantially to livestock production.

POTENTIALLY IRRIGABLE AREAS

An estimate of over-all irrigation possibilities from the standpoint of irrigable areas appears in the National Resources Board Report of 1934. This report contains an inventory of land in the West—which ultimately may be irrigated—of 51,535,000 acres; this exceeds by about 30,000,000 acres the land now irrigated. The estimates of the National Resources Board have been modified by later detailed surveys in several areas. The present proposals regarding the Missouri Basin add about 1,800,000 acres to the estimate of 1934. Estimates of irrigation possibilities sometimes include land dry farmed and do not represent entirely new cropland. If the dry cropland is excluded the actual new area to be added to the present cropland by irrigation is considerably less than the total in new irrigation projects. Recent estimates of new-land irrigation possibilities are about 20 million acres. Watershed management and protection will be necessary to assure dependable sources of water for this additional acreage.

An inventory by the Bureau of Reclamation of all projects under construction, authorized, being investigated, or proposed, indicates they would reclaim an acreage of 13.2 million, or about two-fifths of the possibilities listed by the National Resources Board report of 1934 (*65, p. 129*). A summary of these estimates of potential irrigation development is contained in, *Irrigation Agriculture in the West*, Miscellaneous Publication 670, United States Department of Agriculture, 1948 (*49, p. 9*). These projects also would supply supplemental water to about 7.8 million acres, or nearly two-fifths of all land being irrigated. More land suitable for irrigation is available for development than there is accessible water with which to irrigate it. Irrigation is pushing toward the limit of the available water supply in many areas. With the current and planned expansion in irrigation, it appears reasonable to expect that in the next 25 years an additional 5 to 10 million acres will be irrigated (table 2).

TABLE 2.—*Federal reclamation projects under construction authorized, being investigated, or proposed, January 1948* [1]

State	Federal reclamation projects			
	Under construction or authorized		Under investigation or proposed [2]	
	New lands	Supplemental water	New lands	Supplemental water
	Acres	*Acres*	*Acres*	*Acres*
Arizona	109, 285	0	145, 250	607, 660
California	800, 500	1, 220, 000	963, 000	890, 000
Colorado	3, 300	1, 100, 700	718, 745	781, 615
Idaho	62, 270	742, 320	730, 120	236, 110
Kansas	237, 020	830	0	0
Montana	903, 860	265, 600	133, 300	77, 300
Nebraska	1, 137, 840	20, 960	0	0
Nevada	0	0	97, 800	99, 780
New Mexico	38, 387	0	171, 900	146, 250
North Dakota	1, 222, 810	0	0	0
Oklahoma	50, 792	0	180, 800	600
Oregon	47, 005	0	1, 018, 575	211, 700
South Dakota	1, 013. 110	23, 300	0	0
Texas	2, 080	7, 520	879, 120	616. 780
Utah	0	53, 792	158, 647	217, 933
Washington	1, 054, 500	0	492, 300	108, 170
Wyoming	415, 340	177, 800	422, 760	154, 910
Total	7, 098, 099	3, 612, 822	6, 112, 317	4, 148, 808

[1] Reclamation . . . A National Investment (*36, p. 4*). Data from Bureau of Reclamation.

[2] Data subject to change on issuance of Federal long-range program.

PAST LAND DEVELOPMENT

Development of land by clearing of forests and by drainage and irrigation has been going on since colonial days, as has the counter shift of depleted cropland to pasture and woodland. Agricultural development and abandonment both have proceeded from east to west, with the earliest major changes taking place in the Eastern States. Available statistics do not permit an exact measurement of these trends, but data concerning irrigation, drainage, and extent of forested and agricultural lands are of interest here.

New ventures in land clearing, drainage, irrigation, and other forms of improvement probably will continue as long as there is undeveloped land that holds promise of supplying the operator with a reasonable level of living. But opportunities of this kind have become more and more restricted. Although the present forest, plus the unimproved pasture and range, is about two-thirds of the total land of the country, a large part is rocky, hilly, and mountainous; another large part is inadequately drained; and much of the smoother, well-drained land has soils that are too poor or too dry to be considered potential farm land. In fact, the greater part of the remaining forest and grazing land must be considered, at present, as coming close to the economic margin for competitive crop production, given average demands and prices.

The conversion of forest and cut-over land into productive farms is slow work, and has frequently taken the labor of more than one generation. To succeed, a farmer needed considerable initial resources; or during the first years he earned the larger part of his living from other work or lived very meagerly. Development of land for farming has been costly in time and other investment.

Farm Land Cleared From Forest and Woodland

Clearing of forests to make room for homes and farms has been a continuous process from the time of the first white settlers. Some fields in the East have been cleared, cultivated for a time, and then allowed to revert to forest, only to be cleared again at a later date and the cycle repeated. Expansion of agriculture through the clearing of the forest in one place is partly offset by the return to forest of abandoned and depleted farm land in other places. Clearing occurs not only in connection with new settlements and new farms but also in connection with enlargements of pasture and cropland acreages on existing farms.

Specific information concerning timber clearing and its counter movement—reversion of cleared land to forests—is available only for limited areas and for short periods.

Estimates of change in the acreage of timberland do not reveal the true picture because land cleared in one period may revert to forest and then be cleared again at a later date. Furthermore, surveys of the acreage and character of forest land have been improved with the years, through expansion of the surveys and through refinement in classification of land. These improvements make recent estimates of the acreage of timberland superior to and not strictly comparable with earlier estimates.

Statistics concerning the acreage of agricultural land in farms (cropland, pasture and farmsteads, etc.; or land in farms minus farm woodland) are indicative of trends in timber clearing and in reversion of cleared land only in a general way, as only net changes in the acreage of agricultural land are shown. For example, declines in an area or a part of an area or part of a county, which are offset by increases in another vicinity, are not shown.

The original forested area of the country (exclusive of an estimated 84 million acres of arid woodland) has been estimated at 820 million acres (*39, p. 9*). Before 1850, large-scale farm settlement took place almost entirely in the forested area of the East, except for a few scattered locations on the prairies and in the far West. The land cleared and improved has been estimated at about 25 million acres in 1790 and 113 million acres in 1850 (*4*). By 1880, about 150 million acres of the original eastern forest had been cleared for farms and the bulk of the timber had been destroyed because there was no market. Before 1880, land clearing for agriculture was greater than that cut over in lumbering. Since then, growing demand for lumber has caused land to be logged off more rapidly than it was taken up for agriculture. A large part of the area now being cut over annually for forest products is not clear cut. Total land cleared from forest now in use for farming and other nonforest purposes is estimated at 375 million acres. Some 25 million acres of this is used for such things as roads, cities, and parks.

Since 1880, agricultural land in the originally forested counties east of the Great Plains, which reached their peak acreage in agricultural land in 1945, has increased by nearly 148 million acres. In the same time, however, other counties in that region have had a decline in agricultural land of 80.3 million acres, thus making a net increase for the eastern originally forested region as a whole of 67.4 million acres (table 3). Land clearing and other improvement, from 1945 to 1948, probably has raised this net increase to 70 million acres.

TABLE 3.—*Changes in agricultural land, originally forested counties, east of the Great Plains, 1880–1945* [1]

Period	Change in agricultural land [2]		
	Gross increase	Gross decrease	Net change
	1,000 acres	*1,000 acres*	*1,000 acres*
1880–1909 [3]	93, 010	30, 166	62, 844
1910–19	15, 119	10, 549	4, 570
1920–29	7, 202	20, 932	−13, 730
1930–39	23, 589	4, 878	18, 711
1940–45 [4]	8, 721	13, 743	−5, 022
Total	147, 641	80, 268	67, 373

[1] Agricultural land is all land in farms as reported by the agricultural census, minus woodland in farms. It comprises chiefly cropland, open pasture, and farmsteads. Tabulations and calculations were made by BAE. Earlier tables for the years 1880 to 1930 appeared in S. Doc. No. 12 (*60 V. I, pp. 154–158*).

[2] Gross increase is the total of increases in counties having increases in agricultural land and gross decreases is the total of decreases during the period.

[3] The censuses of 1890 and 1900 did not collect data for woodland in farms.

[4] Data for 1945 relate to Jan. 1; for 1940 and 1930 to Apr. 1; for 1920 to Jan. 1; for 1910 to Apr. 15; and for 1880 to June 1.

Great activity occurred in land clearing just after World War I and again during the depression. In the 5 years 1920–24, slightly more than a half-million farmers reported, in the 1925 Agricultural Census, that they had cleared approximately 4,200,000 acres of cropland. In these same years, the census shows that while land clearing was going on there was a total decline in agricultural land in farms of 7,600,000 acres.

Agricultural land increased by nearly 8,000,000 acres net between 1930 and 1935, in the originally forested counties east of the prairies and plains. The total increase in the counties reporting an increase exceeded 12,000,000 acres. Most of this land must have been cleared of forest or brush. Apparently, the depression brought back land clearing to many farmers and to more would-be farmers. In the Lake States, the increase in agricultural land exceeded 2,000,000 acres, and in the Southern States, 2,800,000 acres. In Ohio, it was 958,000 acres. In New England, however, the forest apparently continued to encroach on the agricultural land in many counties.

Probably 75 million acres of the land now in cropland and pasture have been cleared more than one time, having been abandoned for crops, allowed to grow up in trees, then later recleared for farming. Possibly today 75 million acres of formerly cleared land are now in forest or brush (*3*). Consequently, the total area cleared of forest growth, one time or another, in the originally forested counties is much greater than the acreage now in crops and open pasture. These estimates indicate it is probable that as much as 150 million acres are subject to this long-time rotation of clearing from forest for field crops and pasture, then reversion to forest and possibly later reclearing for farming. An illustration of the changes in the area of cleared agricultural land and cropland harvested from 1880 to 1945, by regions, in the originally forested counties east of the Great Plains is shown in figure 1.

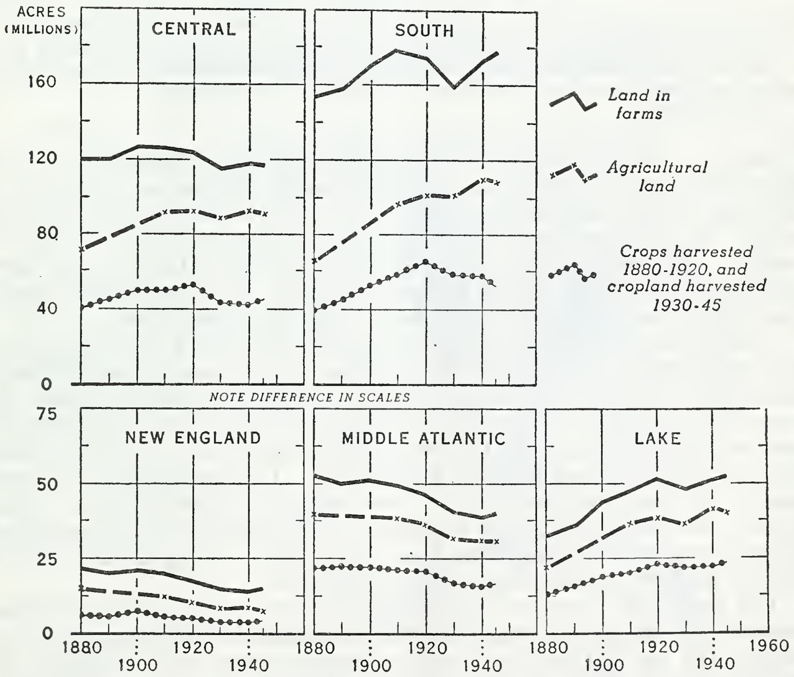

FIGURE 1.—Agricultural land declined substantially from 1880 to 1945 in the New England and Middle Atlantic States but there was an increase from 1940 to 1945. The Central and Lake States show consistent increases in land used for agriculture. Some areas in the South, as the Mississippi Delta, have had large increases in land used for farming because of clearing and drainage; in the Piedmont and hill country large acreages have reverted to forest.

Extent and Condition of Drainage and Irrigation Enterprises

PRINCIPAL DRAINAGE REGIONS

There were approximately 87 million acres of land in organized drainage enterprises in the United States in 1940. Of this large acreage, table 4 shows that about three-fourths, or 67 million acres, was classified as improved farm land. The acreage of improved land in drainage enterprises increased by 23 million acres, or over 1 million acres per year, in the 20-year period 1920–40. By far the greatest increase occurred between 1920 and 1930.

Table 4.—*Drainage: Agricultural land in drainage enterprises in the United States, 1920–40* [1]

Year	Acreage in enterprises	Land in occupied farms [2]	Improved land	Land in planted crops	Land available for settlement
	1,000 acres	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*
1920	65, 495	(3)	44, 288	(3)	(3)
1930	84, 408	68, 640	63, 514	54, 428	7, 987
1940	86, 967	70, 068	67, 389	49, 614	4, 569

[1] U. S. Bureau of the Census, Drainage of Agricultural Lands (*53, table 1, p. 1.*)
[2] Land outside occupied farms includes undeveloped woodland and other land; part is held for development and part is available for settlement.
[3] Not available.

Nearly a billion dollars has been expended by organized local and State drainage enterprises to construct outlet ditches and install tile, improve stream channels, and do other kinds of community drainage work. In addition, large investments have been made by other public bodies. The individual enterprises vary in size. Large areas have been benefited by increased farm production and from better health resulting from reduction of malaria-carrying mosquitoes.

No exact figures are available to indicate the extent of land drained on farms outside of drainage districts, but from census reports it seems certain that at least between 40 and 50 million acres have been improved in this way. Here the work depends entirely on the farmers who undertake to improve the drainage of their land. Field ditching and tile draining are mostly of this type. On the other hand, community drainage ditches and tile lines usually are provided by organization of drainage districts regulated and operated under State laws. These laws confer legal power for constructing and operating ditches and for assessing, collecting, and paying costs.

The principal areas in which drainage enterprises have developed include (1) the prairie and adjacent level uplands of the Midwestern States, (2) the bottom lands of the large streams of the Mississippi Valley, (3) the bottom lands along smaller streams of the Piedmont and hill areas of the South, (4) the Coastal Plains of the East and South, and (5) the irrigated areas (fig. 2).

Nearly two-thirds of the total land in organized drainage districts is in the Midwestern States (table 5). In this region, drainage en-

Table 5.—*Acreage in drainage enterprises, improved land, and wet land outside enterprises, by regions of the United States, 1940*

Region	Area in organized drainage enterprises [1]		Wet, swampy, and overflow land outside organized drainage enterprises [2]
	Total	Improved land	
	1,000 acres	*1,000 acres*	*1,000 acres*
Northeast	578	398	4, 024
Appalachian	1, 936	1, 261	10, 138
Southeast	5, 988	845	27, 875
Lake States	20, 730	16, 547	17, 001
Corn Belt	32, 194	29, 428	5, 964
Mississippi Delta	11, 703	7, 462	18, 215
Northern Plains	3, 227	2, 884	2, 812
Southern Plains	4, 416	3, 134	7, 867
Mountain	2, 773	2, 410	----------
Pacific	3, 422	3, 020	3, 436
United States	86, 967	67, 389	97, 332

[1] From Drainage of Agricultural Lands (*53*).

[2] From a drainage reconnaissance survey made by technicians of the U. S. Department of Agriculture for the National Resources Board (*65*).

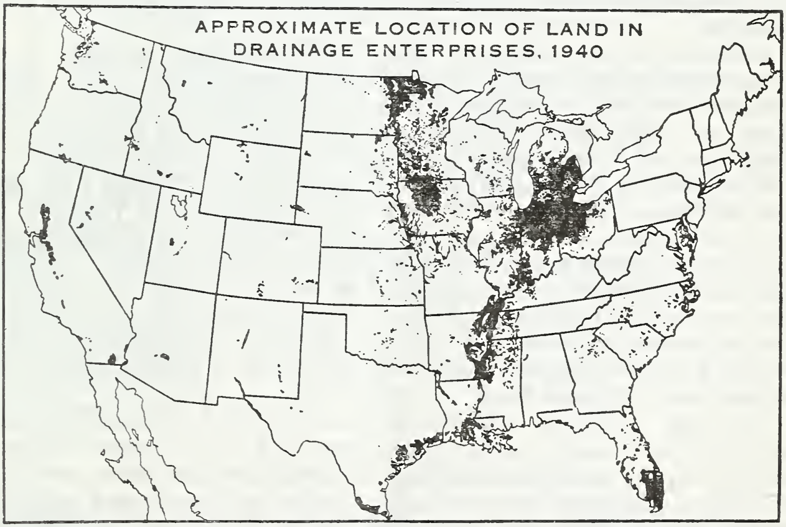

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Figure 2.—More than 87 million acres are included in organized drainage districts. About three-fourths, or 67 million acres, is improved land. Of the unimproved land, 4 million acres were classified by the 1940 census as available for settlement. From 40 to 50 million acres outside of organized districts have been improved by farm drainage.

abled the cultivation during the last century of 45 million acres of rich agricultural land that had formerly been too wet. The experience of drainage in these States leads to the conclusion that about 90 percent of the drainage enterprises have been reasonably successful (*1*).

Drainage Problems and Their Solution

Drainage of bottom lands in the lower Mississippi Delta and along the other large rivers and their major tributaries in the Mississippi Valley, including the Missouri, Ohio, Wabash, and Illinois Rivers, the Red River of Louisiana and Arkansas, and the Red River of the North, have contributed to development of much fertile land for farming. Construction and maintenance of drainage works generally has been more costly than in the prairie areas and other adjacent uplands. Many drained areas have been aided by flood-control works of the Army engineers and by State assistance. Some of the chief problems in such areas are overflows, silting of channels, and inadequate drainage outlets and lateral systems.

Many drainage channels serving bottom lands in the Piedmont and other hill areas of the South have not been successfully maintained for long periods as eroded soil from the hillsides and uplands have filled the channels. Frequent redredging has been necessary. Improvement has been obtained by selection of the less sloping lands to cultivate, by erosion-control practices, and by systems of farming that include large acreages in close-growing crops and pastures and in well-managed woodlands. Some failures of drainage enterprises have occurred in west Tennessee, northeastern Mississippi, and north Georgia.

Drainage on a community basis in several large sections of the Coastal Plains has been more limited in extent than in the regions already described. Well-planned and selected projects have succeeded. Much successful drainage has been accomplished in Maryland and Delaware and in some parts of North Carolina and other States.

Vast areas in the Coastal Plains, particularly in Texas, Louisiana, and all States bordering the Gulf and Atlantic up to Virginia, are potentially agricultural lands. Control of floods on the large streams is necessary before some of these large areas can be drained. In many sections, drainage and flood-control works are beyond the ability of the local people to finance. Often drainage problems are so complex that extensive agricultural and engineering investigations will be required before adequate plans can be formed for development and improvement of farm land.

Drainage problems arise in irrigated areas from overirrigation, seepage from canals, and at times from lack of drainage ditches to carry away the water not absorbed. Control of excess water, provision of drains, pumping from wells, drying up wet areas and using the water for irrigation are recognized means of drainage on irrigated land. Provision for drainage of irrigated land often is an important factor in successful farming.

The drainage committee of the American Society of Agricultural Engineers in its report of June 1946 pointed out reasons why some drainage enterprises have been less successful or have failed. This report says that best results have not been obtained in many drainage enterprises owing to (1) attempts to drain and farm land that is of low soil fertility or otherwise not adapted to cultivation, (2) inadequate planning of the drainage area and design of improvements, and (3) poor construction or maintenance. These difficulties often mean lower crop yields than those of naturally well-drained areas.

The full benefits of drainage can be attained best by selection of land that has been proved suitable for farming and that can support a sound agricultural economy. A usual problem is that many drainage enterprises are too small in acreage to undertake the necessary works and consequently have inadequate outlets and flooding of lands, both within and downstream from their districts. Coordination of drainage works and incorporation of larger acreages are essential to efficient operation.

Many drainage enterprises have the ever-recurring problem of siltation of channels, tile, and other structures. Removal of silt and repair of damage has been a major cost in maintenance of drainage. Solution must come, largely at least, with more effective control of erosion on the watershed areas and along the stream channels that contribute the silt and debris. Soil conservation districts in cooperation with drainage districts are meeting this problem to an increasing extent by activities to stabilize stream channels and to control erosion on watersheds.

Drainage districts as a whole are now in better financial position than in many years. High farm incomes during the last few years, following the adjustments in debt made possible in many districts through the aid of loans by the Reconstruction Finance Corporation during the late 1930's, have enabled many districts to pay off indebtedness at maturity and to accumulate some reserve funds. Considerable amounts are being spent in cleaning ditches and improving outlets. Mention should be made of the additional work in improvement of stream channels which the Army engineers have been authorized to undertake or plan since 1944 for major drainages. In total, an immense volume of flood control and drainage work is now going on or is being planned in the United States. Some important investments are being made, by States and local districts, as those by certain parishes and districts in Louisiana.

Experience in drainage and recent studies of drainage possibilities indicate that improvement can be made by additional drainage along two lines: (1) Rehabilitation of existing drainage works in areas that are proved to be productive where structures need repair, enlargement, or coordination with adjoining drainage areas and (2) new drainage construction in undeveloped and partly developed areas found economically feasible for development.

Status of Irrigation Development

The harvested cropland and pasture irrigated in the United States in 1944 was approximately 20.5 million acres contrasted with about 18 million acres in 1939. The increase of 2.5 million acres in the harvested cropland and pasture irrigated from 1939 to 1944 was made by planting irrigable fallow and idle land as well as by development of some additional dry farm and raw land for irrigation. The total acreage under irrigation in 1948 was estimated to be approximately

22 million acres. This area subject to irrigation includes all irrigated cropland planted, idle or fallow land, and pasture.

Some 91,637 irrigation enterprises served 291,655 irrigated farms in the 17 Western States, plus Arkansas and Louisiana, in 1940. These enterprises represented a total group investment of more than a billion dollars in structures and equipment exclusive of much individual farm investment. Approximately one-fourth of the irrigation investment, up to 1940, had been made by the Federal Government. It is a much greater sum and proportion today because of large Federal investments from 1940 to 1948 in western projects, as Columbia Basin, Central Valley, and the Missouri and Colorado Basins. Figure 3 shows the general location of the principal irrigated areas; table 6 gives over-all statistics for the 17 Western States and Arkansas and Louisiana.

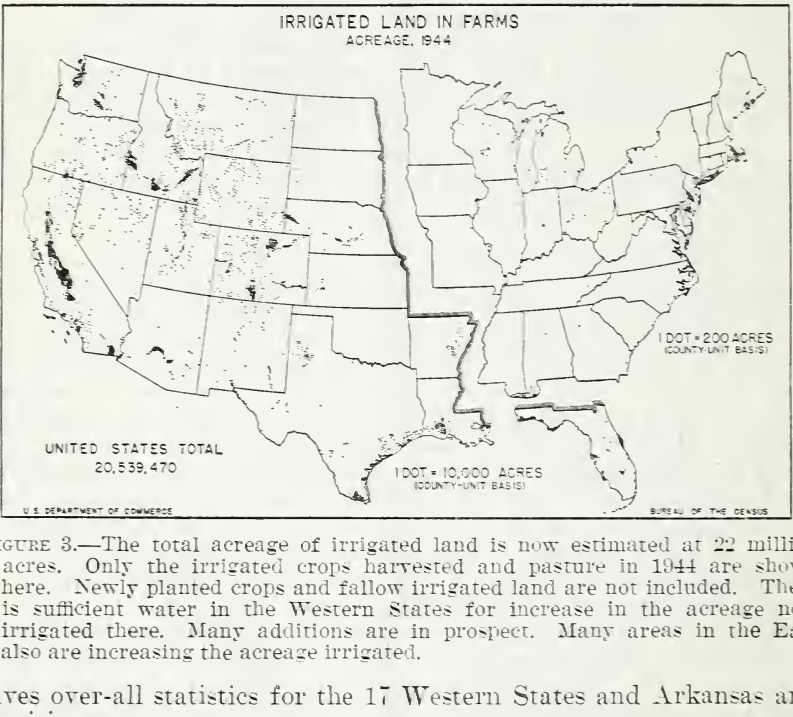
IRRIGATED LAND IN FARMS
ACREAGE, 1944
1 DOT = 200 ACRES (COUNTY-UNIT BASIS)
UNITED STATES TOTAL 20,539,470
1 DOT = 10,000 ACRES (COUNTY-UNIT BASIS)
U.S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS

FIGURE 3.—The total acreage of irrigated land is now estimated at 22 million acres. Only the irrigated crops harvested and pasture in 1944 are shown here. Newly planted crops and fallow irrigated land are not included. There is sufficient water in the Western States for increase in the acreage now irrigated there. Many additions are in prospect. Many areas in the East also are increasing the acreage irrigated.

There is increasing interest in irrigation in States east of the Mississippi River. The Eastern States, exclusive of Arkansas and Louisiana, have about 350,000 acres of irrigated land. Irrigation is being practiced in a few early truck-crop areas of Florida, Georgia, and South Carolina as well as in fruit and truck-farm centers of New Jersey, New York, and Massachusetts. Some technicians and a few farmers who have tried it believe that more irrigation would pay in the lower Mississippi Valley.

For the entire period 1890–1947 the increase in land irrigated and improved by drainage averages about 1½ million acres per year. Since 1930 the average annual increase in acreage irrigated and improved by drainage has been about one-half million acres. The increases in the acreage irrigated and the area of improved land in drainage enterprises are given in table 7. The acreage irrigated in-

TABLE 6.—*Irrigation: Number of farms and acreage in farms and under irrigation in the 17 Western States and Arkansas and Louisiana, specified years*

Year	Farms [1]	Area		
		Farms [1]	Under irrigation [2]	Irrigated crops harvested and pasture [3]
	Number	*1,000 acres*	*1,000 acres*	*1,000 acres*
1890	54, 136	(4)	3, 716	3, 716
1900	113, 849	(4)	7, 744	7, 744
1910	162, 725	(4)	14, 433	(5)
1920	222, 789	(4)	19, 192	(5)
1930	265, 147	78, 339	19, 548	14, 633
1940	291, 655	112, 601	21, 004	17, 817
1945			21, 500	[6] 20, 196
1948 [7]			22, 000	21, 000

[1] U. S. Bureau of the Census—Irrigation of Agriculture Lands (*54, pp. 2–3*).

[2] Irrigation of Agricultural Lands (*54, p. 2*). The total area irrigated for the year preceding the census included crops harvested and pasture irrigated, newly planted young crops, crop failure, fallow and idle land, and other land in farms having water rights, except in 1890 and 1900 when it represented only crops harvested and pasture irrigated.

[3] The area of crops harvested and pasture for the year preceding the census is included in the total area irrigated but does not include newly planted young crops, fallow, and other land having water rights.

[4] Not available. [5] Data for crops irrigated are incomplete.

[6] Data from the 1945 Agricultural Census (*55*). [7] Estimated.

TABLE 7.—*Change and average increase in acreage under drainage and irrigation, United States, selected periods*

Years	Increase of improved land in drainage enterprises [1]	Increase in acreage irrigated [2]
	1,000 acres	*1,000 acres*
Before 1890	3, 162	3, 716
1890–1899	3, 256	4, 029
1900–1909	15, 474	6, 689
1910–19	22, 396	4, 758
1920–29	19, 226	356
1930–39	3, 875	1, 456
1940–44	[3] 1, 000	[3] 496
1945–47	[3] 1, 000	[3] 500
Total	69, 389	22, 000
Average increase per year (*58*)	1, 142	315

[1] From Census Report on Drainage of Agricultural Lands (*53, table 1, p. 1, table 11, p. 4*).

[2] Census Report on Irrigation of Agricultural Lands (*54, table 1, p. 2*).

[3] Estimated.

creased rapidly to 1920. Since then, the increase in acreage irrigated has been more dependent upon public construction and has reflected public interest, especially from 1930 to 1940, and since 1945. The acreage of improved land in drainage enterprises increased greatly from 1900 to 1930. Since then, the increase has been steady but less than in the earlier years.

There are large potentialities for further irrigation in the United States. Recent trends of development have been made in two directions: (1) To go forward with enterprises in the arid parts of the country not hitherto undertaken because of the large initial cost and the need for public assistance in financing, and (2) to extend the use of irrigation to supplement inadequate rainfall or poor distribution in the less arid or even high rainfall parts of the country to reduce the hazards of drought or to obtain larger yields than natural rainfall will produce. Of these two potentials, the second probably is the larger, as to both acreage and effect on total production.

RECENT AND PROSPECTIVE FARM LAND DEVELOPMENT

In a survey of agriculture by the Bureau of Agricultural Economics in 1946, it was found that during 1945 land was cleared of trees and brush on 3 percent of the sample farms surveyed. In the same survey about 4 percent of the interviewed farmers reported land-drainage work during the year. Information available on leveling land indicates that the acreage of new land prepared for irrigation probably ranged from 100,000 acres annually in the war years up to 300,000 acres or more per year in 1946 and 1947. After allowance is made for overlapping of land both cleared and drained, it appears reasonable to conclude that a million acres of farm land on existing farms were developed by clearing, drainage, and irrigation, during 1945.

For the country as a whole, the acreage of new land developed as compared with the total acreage of cropland was not large during the period 1940–45—probably not more than 4 million acres, or less than 1 percent of the total. In 1946, 1947, and 1948, much more land was developed than was possible during the war.

In 1948, it is estimated, farmers developed 1½ million acres of new cropland, including development by clearing, draining, and irrigation. A large part of this new acreage, however, is not a net gain in cropland acreage but replaces land which has gone into building sites for towns, industries, roads, airports, flood control, power and water-supply reservoirs, parks, and other nonfarm uses, or it takes the place of rough and eroded land converted to pasture or forest. Much of the new acreage is to enlarge farms which have too few crop acres.

LAND IMPROVEMENT ON EXISTING FARMS

Intensive action programs of land-use improvement and conservation in progress for several years have been an influential stimulus in carrying out land-development practices. Technical aid, and financial and material assistance have been provided to farmers and ranchers in carrying out approved farm plans, and specified practices have included land clearing, drainage, and leveling land for irrigation, where such improvements have appeared to be in the interest of conservation. Much land improvement also has been done by farmers and ranchers without public assistance. Tractors, bulldozers, and other power machinery are making it possible for more farmers to undertake new land development and improvement of old land. Most of this land is already in farms.

Group drainage, flood control, irrigation, and water-management projects are among the main activities in many soil-conservation districts. More than 3,600 group-job plans had been prepared by soil-conservation technicians by the end of 1947. These plans were designed to benefit all or parts of 51,000 farms. Work had been carried out, at that time, on more than half these projects, thus benefiting 28,000 farms.

The report of the agricultural conservation program for 1946 shows that 52,000 participating farms in 736 counties received financial assistance in clearing 357,000 acres of land. In 14 Western States, leveling land for irrigation was done by more than 24,000 farmers on 751,000 acres through the aid of the conservation program. The records indicate that drainage work was carried out by more than 100,000 cooperating farms on approximately three-fourths of a million acres. It is estimated that possibly one-half of the land drained and prepared for irrigation was new land not previously in crops.

New Farms by Irrigation and Homesteading

Public land on seven Federal irrigation projects was opened to homestead entry during fiscal year 1947 (*63*). About 250 new farms, totaling approximately 20,500 irrigable acres, were made available on the 7 projects. Veterans of World War II were given preference. Because of the number of applicants, awards were made by means of drawings among the eligibles. Some 18,500 acres of public land in 5 project areas, comprising over 200 farm units, were opened to entry in fiscal year 1948.

Reports indicate that approximately 153,000 acres, the majority of which are in private ownership, received a full or partial supply of irrigation water during 1947 for the first time, through Federal reclamation projects. This land was located on approximately 2,000 farms and ranches.

In all, the schedule of work called for supplying water to about 200,000 additional acres in 1948. About three-fourths was new land and received a full supply and the remainder received supplemental water. Probably 3,500 farms and ranches were benefited by this water supply.

A statement of the irrigation development planned for the immediate future appears in a report by the Bureau of Reclamation—The Reclamation Program—1948–54 (*68*). This report shows that the current reclamation program is designed to irrigate 2 million acres of new land and supply supplemental water to 3.6 million acres of existing farm land. It also indicates that 24,000 new farms could be created and 66,000 existing farms benefited by this 7-year program. These acreages include service from Columbia Basin, Central Valley, and other large projects, where much of the construction has been completed; lateral ditches are yet to be built, land leveled, etc.

To provide the full opportunity for settlers to develop their farming as rapidly and effectively as possible, Federal and State agencies are arranging to provide necessary technical services. Advice and assistance are given in clearing and leveling irrigable lands, making lay-out of water distribution and drainage systems; in control of weeds, cropping programs and cultural practices, livestock operations, and farm management and credit.

Very little of the Federal public land remaining in continental United States is naturally adapted to arable farming. The areas suitable and feasible to improve are being located, irrigated, or otherwise made suitable for farming or other uses. The small number of homestead entries and other disposals in the States are significant.

A total of 243 final homestead entries, embracing about 30,000 acres, was made during 1947 in the United States, including Alaska. Other final entries of land totaled 414, comprising slightly more than 22,000 acres. At the end of the year, about 4,000 entries, covering 600,000 acres, were pending, awaiting compliance with public-land laws.

Land-classification work is being carried forward in Alaska, and considerable acreages appear to be suitable for homesteading. These generally need access to roads, markets, and other community facilities. Special studies are being made to guide future settlement.

As yet little is known about some of the areas classified. Further studies and trials on the ground of desirable crops and practices are urgently needed in each new area. For example, fertilizer may be necessary in some places, if the lands are to give satisfactory yields. On some lands conservation and special management practices are needed to prevent erosion. Clearing costs and other costs of improvement and operation of farms are high now relative to costs, in the States. Even so, some types of agricultural production could be expanded faster than local markets could absorb it.

A review of land development by regions of the country indicates that in many areas new land brought into cultivation during the last few years has been a very small proportion of the total acreage available for agriculture. In fact, data from agricultural and land-inventory surveys show that in some regions more cropland has been shifted to pasture, forest, and other uses than has been developed for crops. Most of the increase in crop acreage during the last few years came from planting idle and fallow cropland and plowable pasture land, and not from development of new land.

CLEARING AND DRAINAGE

LAND CLEARING AND IMPROVEMENT IN THE NORTHEAST

More than 100,000 acres of land were cleared of trees or brush or otherwise substantially improved in the Northeast from 1940 to 1948. With few exceptions, this activity was confined to land already in farms or to land that had once been in farms. Nearly all this newly developed land was in small acreages added to many different truck, fruit, dairy, and poultry farms which were already going concerns and could afford to pay for some expansion out of their earnings. The fact that the land has once been abandoned is not necessarily a good measure of the present desirability of development, in view of modern technology and growing local demands for milk and certain other products.

Some large areas are publicly owned and managed for vital public uses, as forests, watershed protection, municipal water supply, and recreation areas. This public land is mostly steep, rough, and stony. Large acreages are necessary for essential community services in a thickly populated region as the Northeast. Other lands have been abandoned for farming and allowed to grow up again in trees and brush. Less land has been abandoned in recent years and significant acreages are being redeveloped. The number of rural homes around industrial areas has increased, but these have required little new-land development.

Particularly in southern New England, and, to some extent, in the Middle Atlantic States, rather extensive acreages are being built up and becoming urbanized. For example, the urban-land area in Connecticut has increased 15 percent since the end of the war. Industrial uses and public facilities have expanded to occupy considerable agricultural land. Many undeveloped nonurban areas are held at prices that reflect urban residential and industrial potentialities. Their purchase for farming, therefore, is definitely not feasible under prevailing circumstances.

Recent studies of postwar readjustment and land improvement in Massachusetts conclude that significant areas of undeveloped farm land of suitable quality may be located on farms and in adjacent rural areas for enlarging any farm units that may be too small and for possible addition of some new farms (*9*, *41*). These studies found many instances of successful land improvement with modern power machinery, especially bulldozers, power shovels and saws, and bog harrows. In Massachusetts an estimated 9,195 acres was cleared of trees, brush, stumps, or stone, or was drained from 1940 to 1944. In Vermont 13,553 acres were improved in the same period. Since the war land improvement has expanded.

Costs of land improvement varied with the type of work and the cover. Where brush was cleared for seeded pasture, the cost for total clearing ranged from $50 to $110 per acre; and where woodland was cleared for orchards, vegetables, and other cultivated crops, the costs ranged from $95 to $160 per acre, because a more thorough job was necessary. Light brush and shrub growth on old pastures and recently abandoned fields were cleared at relatively lower costs—from $15 to $30 per acre. As the outlay in developing land is heavy, it is important to make careful study of costs and returns before work is undertaken. What will work for one piece of land or for an individual will not necessarily apply to a large area or a group.

Much new cropland might be developed by clearing and other kinds of improvement within farm boundaries, but by itself would seldom be sufficient for an additional full-time farm. In fact, a prospective farmer might have to rent or buy parcels from three or four owners, and even then the land would rarely lie in a contiguous tract (*41*, *75*). It is reasonable to expect, therefore, that in an area so long settled few new farms will be available from land that has never been farmed, or which once was farmed but has been allowed to revert to woodland because cultivation in competition with other land, or other occupations was unprofitable. In Connecticut, some 5,000 to 7,000 acres of land have been reclaimed by farmers since 1945, and an additional 20,000 acres possibly will be cleared of brush and stone or drained within the next few years. Much work is being done in that State through the soil conservation district program. Costs of clearing by use of heavy equipment are $50 to $100 an acre, and seed and fertilizer for permanent pasture comes to another $30 to $35 an acre, under 1948 prices. The major emphasis is enlargement and improvement of existing farm units, especially development of pastures, improvement of wet spots, clearing brush, and removal of stone. The use of chemicals in clearing brushland for pasture appears to be promising. The use of mechanical irrigation systems is spreading for commercial vegetables, potatoes, tobacco, and pasture. The problem and cost of obtaining a water supply for all farm purposes has an important bearing in the development and improvement of land. This problem deserves careful study.

As of January 1948, 5,500 acres had been planned for clearing, and 1,100 acres marked for drainage, in Rhode Island, under the soil-conservation program. Recent work of this kind covered about 1,500 acres. Costs ranged from $30 to $125 an acre. Much of this improved land went into hay and pasture. Somewhat lesser acreages have been improved independently of governmental programs. Some poor land is being returned to woodland.

In New Hampshire, a considerable number of farm operators have expanded their business in the last few years by buying or leasing semiabandoned or abandoned farms near their home farms. With modern tractors and machinery they have been able to operate individual pieces of land to advantage. In other words, these farmers have found it more practicable to buy or rent abandoned tillage land 3 or 4 miles away than to clear land adjacent to their present fields at great expense. This practice in taking over and operating abandoned and semiabandoned fields has prevented much land from growing up in brush during the last few years. Indications are that this kind of operation will increase and that more and more farmers will seek control of semiabandoned fields with which to enlarge their business.

Some farmers are now clearing land on a modest scale to provide additional pasturage or additional field land so they can increase their production of milk. Considerable interest is being shown in the possibilities of clearing land by large power equipment, but the cost is likely to restrict the acreage. It is likely that very few new farm units in New England will be created by new clearing.

Farmers are greatly interested in preparing their present tillage land for the tractor. Many fields have wet places or other irregularities which hinder efficient use of tractors and tractor equipment; this holds down yields and increases the expenses of operation. There is likely to be considerable improvement in the next 10 years through drainage and clearing rocks from land. This will not necessarily add much to the tillable area but will have the effect of increasing yields and output per man.

Much poor or marginal farm land is to be found in the Northeast. In New York State, for example, are numerous abandoned farms with poor land (*24*). Many are for sale. They did not support adequately their original owners when living standards were relatively low, and few will support a farm family today. Some might be suitable for rural residences, summer homes, or part-time farms if accessible, and if steady off-farm employment can be assured, but few abandoned farms will ever make paying full-time farms. In general, most of this land would find its best use in forestry, grazing, wildlife, and recreational uses.

More than a million acres of generally poor land are in the pine country of southern New Jersey (*25*). The only improved farm land within it is in scattered cranberry bogs, blueberry patches, and occasional groups of small farms. This country has been "promoted" for many years by land developers. Its location might suggest its desirability for farming because of proximity to markets, but, in general, natural resources are poor for farming, forest fires have been frequent and devastating, and the soil is sandy and of low productivity. Much of it, settled at one time or another, has been abandoned. Land is now being offered for sale in small or large tracts. Few parcels in the pine lands should be expected to provide farms from which to make even a reasonably satisfactory living.

The greatest opportunities for expanding farming in New York and New Jersey, as in other States of the Northeast, lie in the good-land areas, where most of the land is already in going farms, but where systems of farming and farm practices could be shifted to increase the income. Much of the abandoned land is unfit for profitable farming. There are far too many people going ahead with plans to redevelop farms on poor land. Unfavorable seasons and hard times strike doubly hard on those who must try to live on the income from a "cheap farm."

There are some possibilities of new types of farming developing on some of the more favorable pieces of abandoned farm land in the Northeastern States. For example, several thousand acres of the more fertile land have been developed during the last 10 years into potato farms which apparently are well established. In New York, 1,650 farmers received financial aid from the agricultural conservation program in clearing about 13,000 acres for pasture and tillage during 1946.

A great deal of farm land is being improved in Pennsylvania by such methods as clearing small patches of brush, by drainage of wet spots, and application of lime and fertilizer, and by reseeding pastures. Several large ditching machines are being used in tile and other drainage. In many cases it is improvement of cropland; in others it is improvement of pasture land for use as cropland. Little actual new land is being drained or cleared for either pasture or crops except small spots needed to increase the size of fields and improve a farm lay-out.

Drainage is often a real problem for farmers in the level coastal plain of Delaware and Maryland. Streams and ditches require dredging and cleaning to provide proper outlets for the excess water which at times delays planting and at other times damages growing or mature crops. A recent report by Norman R. Urquhart, Drainage Problems and Systems of Farming in the Pocomoke River Watershed of Sussex County, Del. (*74*), concludes that farm benefits from the improved drainage program in progress in this 10,000-acre watershed will exceed the costs. Benefits will be reaped only by those farmers who take advantage of the improvement by installing farm drains and improving their crops and livestock and adjusting their farm practices and systems of farming to the land.

Somewhat more emphasis might be given to drainage in the Northeast. There are not many large areas suitable for development by drainage, but there are many small ones. This is illustrated by the map made by the Soil Conservation Service and published in the Northeast Agricultural Atlas prepared by the Northeast Regional Postwar Agricultural Committee in 1945 (*51*).

NEW LAND IN THE LAKE STATES

In the established farming areas of the Lake States, clearing and draining of woodland and other undeveloped lands have been going forward during the last few years, but only a few new units have been developed. The acreage cleared for crops and pasture under the agricultural conservation program in the three Lakes States was 131,000 in 1944, about 137,000 in 1945, and 138,000 in 1946. The number of farms reporting the practice ranged from about 37,000 to 39,000 each year (*47*). An average of about 4 acres was cleared per farm reporting the practice.

The 1945 Census of Agriculture returns for 15 cut-over counties of northern Wisconsin and 13 cut-over counties of northeastern Minnesota show that the number of farms in both areas decreased almost 13 percent during the period 1940–45, while cropped acreage increased 13.6 percent in Wisconsin and 11.4 percent in Minnesota. Land in farms during this period increased.

Along with reduction in number of farms in the Wisconsin and Minnesota cut-over counties was an increase in average size of farms. Apparently some farmers took over neighboring tracts for operation as they were sold or otherwise disposed of by their owners, and cleared or developed additional land within them (*27*). Thus few entirely new units have been taken up recently in these counties; the bulk of new clearing and development was done on existing farms. More clearing and other development have been taking place in these northern cut-over counties since the war.

Between 1940 and 1945 the number of farms increased in 16 Michigan counties. Half of these counties are in the central part of the State, three of them are on the outskirts of Detroit, and the other five are in the east-central part of the Upper Peninsula. Though there was a slight increase in the number of farms in some of the counties in the Lake States during this period, there was a decline in the number of farms in the vast majority of the counties in all three States.

The earlier years of 1900–20 saw a steady expansion of farm land in the northern counties of the Lake States. In 14 northeastern Minnesota counties alone the acreage cleared for crops increased from 191,000 to 773,000 acres, or more than 300 percent during these 20 years, while the number of farms increased 197 percent.

Two million acres of woodland in northeastern Minnesota might be converted into 20,000 farms if cleared, drained, and equipped, according to an estimate appearing in a recent Minnesota Agricultural Experiment Station Bulletin (*78*).

Decline in the timber industry in all three States following 1920, decrease in the value of farm products, general scarcity of employment, and increase in taxes, eventually brought about a wave of tax delinquency which resulted in land abandonment and forfeitures principally in the cut-over counties. The peak of forfeitures seems to have passed by 1940, and gradual improvement has been noted since. The limitations of the northern cut-over area for farming are now generally realized, and much of the land that cannot be economically farmed is in private forest ownership, while some that has gone into public ownership or farm settlement is restricted by State legislation and county zoning ordinances. The war period, with higher crop prices and increased employment, helped to stabilize the area, but there are still many occupied farms with too little in the way of cleared land, buildings, livestock, and machinery, for full-time farmers. Such development as has occurred recently in the cut-over counties has been confined mainly to partially developed farms.

Although the total acreage of new farms developed in recent years in the Lake States as a whole has been small, the number of tracts of unimproved land that were bought increased during the war, in some parts. Many urban workers have bought partly improved and unimproved land, expecting at some time to make rural homes and farms.

Some land has been drained by individual farmers in the southern part of Michigan. But most of the drained areas are small. Many, if not most, of the projects have been designed to improve land already farmed rather than to make new land available. Muck-land farmers are responsible for most of the land drainage work being carried on.

Farmers have cleared small tracts from time to time, but only a few new farms are being opened up through land clearing. An exception is found in Ontonagon County in the western part of the Upper Peninsula where there are plans and proposals for clearing tax-forfeited and other wild lands for potato farms. A few of the counties in the Upper Peninsula have acquired bulldozers which they let out at cost. Some farmers rent highway equipment for farm-clearing operations. The report of the Agricultural Committee of the Copper Country Development Commission emphasizes the need and possibilities for farmland clearing in the Upper Peninsula but generally speaking, very little is being done.

Land clearing is going on in other parts of the State. Bulldozers are available for this purpose on a rental basis. There are several places in southern Michigan where bulldozers are being used to bury the old rock piles in the center of some fields and to uproot the stumps that have stood for years in other fields.

The Wisconsin College of Agriculture has estimated that perhaps 5,000 to 7,000 new full-time farm units might be found among the 3 million acres of cut-over and forested rural areas largely in central and southern Wisconsin not restricted against year-round residence. Clearing and drainage are pretty generally needed to prepare this land for farming. Most of the available land suitable for farming is in farms, as already pointed out. Moreover, it will take considerable capital to acquire and to operate it (*80*).

The Lake States also contain large reaches of wild land very sparsely populated which, according to State classifications, is not adapted to farming and year-round occupancy. Much of it is better suited to forest, recreation, and wild game. Many forested and swampy areas are limited to forest and recreational uses because soils are poor and there are no roads and other year-round living facilities. These wild lands afford only a poor chance for farming; that is why they are classified as nonfarming lands.

Some cut-over land may be developed (*43*), but in the Lake States generally, where settlement of the better and more readily available lands is virtually complete, the remaining undeveloped areas are largely cut-over, forested, or wet places on which development of new farms will be slow and costly. In Michigan, for example, where large acreages came into possession of the State in the 1930's, through forefeiture by nonpayment of taxes, it is reported that only about 10 percent of the State-owned land is good, 18 percent is fair, and the bulk is too poor or wet for farming (*35*).

LAND IMPROVEMENT IN THE CORN BELT

Land improvement rather than new-land development may be expected in the Corn Belt. A recent study shows that Illinois farmers, for example, typical of good-land farmers in the Corn Belt, want to build up the productivity of their soils through soil-conservation measures and use of fertilizers, and to improve their farms generally (*2*). Plans call for extensive ditching, tiling, fertilizer applications, building of erosion-control dams and building of fences over large areas in the next few years. Such land improvement, while it probably will not provide new areas for additional settlement, will promote greater efficiency and production on existing farms.

Farmers in the more fertile parts of Indiana and Illinois are doing considerable tiling of individual fields, deepening and cleaning farm and community drainage ditches, and generally improving the productivity of their farms through drainage operations. They have the money now, and are investing it in improvements that they believe will pay off through greater yields.

Use of commercial fertilizers and good farm practices on many fields that had been virtually abandoned has brought back their productivity much more easily and cheaply in many cases than new land could be cleared or drained. Commercial fertilizer applied to knobs and knolls has produced corn on fields that farmers could no longer afford to farm before the war. The same applies to wheat and some other crops.

Likewise there has been very little recent shift of cropland to other uses. Good pastures are being emphasized, but most of these adjustments take place on individual farms and usually involve rotation pastures rather than permanent pastures.

Among the chief impressions of people who have traveled over the western part of the winter-wheat areas is the shift of land from pasture to cropping by plowing additional land for wheat and other grains. Likewise noticeable farm-improvement work is being done, such as installation of conservation measures, tiling, and spot drainage.

CLEARING AND DRAINAGE IN THE SOUTHEAST

In the Southeastern States, many large wooded and incompletely drained tracts would seem to offer opportunities for additional farm development. This region was settled relatively early, but many areas were skipped over. Land clearing and land abandonment have been a continual process in the Southeast. For example, wartime increases in land abandonment are now being followed by a revival of land clearing and drainage. Land improvement and additions to improved crop and pasture acreage on existing farms appear to offer better possibilities than settlement of new farms (*22*). The cost of land improvement and the problems of establishing and keeping a reasonable level of fertility will restrict new development so long as the demand for farm products can be met more economically from already improved lands.

Travelers along the roads in the Southeast noticed an increase in land clearing and drainage, from 1946 to 1948. Increases in prices of nearly all farm products and strong demand (especially for fruit, truck, and dairy products) have contributed to the increase in land clearing and drainage since the war. Development of pastures and new farms and home sites along the highways, have brought additional acreages into cultivation, but other land has been abandoned. New equipment, as tractors and bulldozers, has speeded up land clearing and drainage in many communities.

Custom work in clearing and drainage is increasing in the eastern parts of North and South Carolina and in Georgia (*17*). Contract rates for land clearing in the North Carolina and South Carolina coastal plain for groups of farmers in several localities ranged from $36 to $50 per acre in 1947. To get the services of a bulldozer, it is usually necessary for 15 to 20 farmers to contract for work.

Reports from the soil conservation districts and the agricultural conservation program show many instances of new land coming into cultivation. Costs, under the 1949 price situation, and the scarcity of machinery and certain materials serve to restrict much of the new development to farmers who have present or prospective high cash incomes, or to people who have other sources of funds. But many farmers who have limited acreages of cropland are adding to them by clearing and drainage (*42*). With more and better farm machinery they can operate larger acreages than formerly. The movement of farm labor into industry in many places accelerates this adjustment.

Few new farms have resulted either from clearing or from drainage in South Carolina, although much land in farms has been improved for pasture and crops. Many new homes may be seen in industrial areas, but they are almost entirely rural residences or homes of part-time farmers, and indicate little net increase, as yet, of the cultivated area. About 12,000 acres of pasture land were cleared in Georgia in 1944, 5,000 acres in 1945, and 22,000 acres in 1946, under the agricultural conservation program (*47*).

In Alabama, some new land resulted from clearing acreages on existing farms. Approximately 12,000 acres of pasture land were cleared under the agricultural conservation program in 1944. An increasing interest is expressed in drainage and to a limited extent in sprinkler irrigation. Recently a drainage project of considerable size has been undertaken in Madison County. Much additional work has been done or is being considered. Nearly three-fourths of a million acres of land that is well adapted to farming needs drainage. Additional suitable land could be developed by clearing alone.

But the gain in crop and pasture land from new land in the Southeastern States, except for specialty crops, has been relatively small in recent years. Abandonment during the war apparently resulted in a loss in cropland. Some abandonment also occurred in pasture land, but it was presumably counterbalanced by the shift of cropland to pasture, timber cutting, and improvement of pastures.

Florida has shown activity in development of new land for truck and other crops, including the drainage of Everglades swamp land around Lake Okeechobee. In 1946, assistance was given by the agricultural conservation program in clearing about 23,000 acres. Land was improved for citrus groves, 1946–48, at an estimated rate of about 10,000 acres a year. On the whole, however, these are high-cost undertakings engaged in mainly by those with considerable investment capital, rather than by small operators with limited means.

Observations from travel and inquiries in Florida indicate much new land in small areas, especially in central Florida, is being placed in cultivation. Some cattle ranches have been greatly expanded. Very considerable expansion in rural nonfarm residential development is going on in many counties with a substantial acreage involved.

Recent farm-land development in the Southeast as a whole has been principally directed toward enlargement of farms, and clearing farmstead and rural-residence sites along highways. Rural commercial development (as tourist accommodations, roadside markets, and gasoline filling stations) is taking place along the main highways. Likewise, part-time farms are being developed near sources of employment, again resulting in relatively few acres of new farm land. Some new farms have been created in the Atlantic and Gulf counties, especially around industrial centers. Numerous tracts have been bought with the expectation of developing farms. Many small tracts are for sale. When some advertised locations are compared with soil and other data pertaining to them, it is evident that only part of the undeveloped land offered for sale is well adapted to farming. Much of it appears better suited to forestry and pasture than for cultivated crops.

Costs of clearing, stumping, and drainage vary considerably, depending upon the kind of work. After saving for use or sale all the timber from clearing operations in wooded areas, such as might be developed in the Southeast, the minimum costs for removal of small trees and brush, without stumping, in many undeveloped areas might still average $25 an acre (*33*). Drainage outlets for swamp and marshland involve expenses too great for most individuals. Some bottom-land areas susceptible of community drainage are for sale. Fairly complete land improvement, clearing, stumping, and farm drainage, with farm labor, will cost $60 to $75 or more per acre. In addition, there would be the costs for buildings, fences, and, in some cases, roads and bridges to provide outlets to county and State highways.

Shifts in Land Use.—At the same time that land clearing has been under way, other nearby lands have been turned out or left idle until young trees and brush have grown up again. During the 12-year period 1936–47 the forest acreage of South Carolina was estimated, through an inventory by the State commission of forestry, to have increased from 10,930,000 to 11,570,000 acres, or by 640,000 acres (*40*).

Comparison of the 1935 and 1945 Agricultural Census reports shows a decline of about 450,000 acres in the land available for crops.

Reports of the forest survey made by the Forest Service for various areas from 1932 to 1941 show that in some parts of the Piedmont new cropland development about balanced or only slightly exceeded cropland abandonment; in other parts abandonment was much greater than clearing. In the North Carolina Piedmont, for example, about 128,000 acres of new cropland were developed in 5 years, or 1.2 percent of the area was developed, whereas in the same time, around 121,000 acres, or 1.1 percent, were abandoned. The south coastal plain of North Carolina had a rate of new cropland development considerably greater than rate of abandonment. In the Virginia Piedmont and the mountain part of North Carolina, cropland abandonment, however, was far greater than new land development (*61*).

The extent of cropland abandonment in the Southeast because of erosion was revealed by the results of the erosion reconnaissance survey conducted by the Soil Conservation Service in 1934. This survey showed 3.35 percent of the Piedmont area from central Virginia to Georgia had been abandoned for farming because of severe erosion. Nearly 40 percent of this area was found to have been damaged by severe erosion.

Old records and written recollections of early residents recall when there was little erosion and streams flowed clear most of the time, and bottom lands grew excellent crops. Since cultivation has been pushed up on the steeper land by cutting away of the forests, many stream channels have been filled by eroded soil and the bottom land has become too swampy for cultivated crops, or has been buried by deposits of sand, gravel, and clay, washed down by frequent floods. During the last 40 years many streams have been dredged of these deposits to reclaim the bottom land. Frequently, erosion has filled the new channels in a few years and the land has again been abandoned or it has become necessary to repeat the costly dredging.

The agricultural history of a farm near the Catawba River in Iredell County, N. C., portrays, since 1850, the cycle of clearing, erosion, and return to forest frequently followed over much of the Piedmont and other hill lands of the South. A soil- and water-conservation experiment station was established on this farm in 1930 and surveys were made of past land use (*8*). About half of this 304-acre farm, including slopes up to 40 percent, has been in cultivation from time to time. Much of the wooded part is even steeper than the cleared land.

As nearly as can be learned, part of this farm was cleared about 1850, and was farmed for 25 years; then it was allowed to grow up in pines; was cleared again about 1900, but taken out of cultivation again in 1925; and was recleared in 1930; part was cleared in 1886; and part was cleared in small fields intermittently from 1916 to 1927. Up to 1930, it had been farmed mostly in general crops, including corn and cotton, with occasional wheat and hay crops and small fields in orchard, truck crops, and pasture. Although there were only a few deep gullies on this farm, several fields were badly cut by small gullies on the steeper slopes and very little surface soil left. An airview of the farm shows the patchwork of fields, woodlands, roads, streams, terraces, contours, and eroded areas.

Although the land-use history of thousands of other farms in the Piedmont had been much the same as that of the conservation experiment station farm, before 1930, there are many farms on which old residents point out land that they believe has been in continuous cultivation since settlement of the area 200 years ago. For example, fields in cultivation near Bethany Church, Iredell County, N. C., were apparently cleared about 1755. Fields on nearby Third and Fourth Creeks are said to have been in cultivation even earlier. Fort Dobbs, built in 1755 for protection during the French and Indian War, was located on a knoll in one of the fields. The early farms usually cultivated land on the level spots along the streams and on the broader ridge tops. Many of these farms with land in cultivation continuously have been in the hands of farmers who followed fairly long-time rotations, with large acreages in close-growing crops (as small grains, clover, and other legumes) and pasture.

The land-assessment book of Iredell County for the year 1800 indicates that much land has been in cultivation many years, for it lists approximately 950 improved farms, that is, tracts of land with houses, barns, stables, and other outbuildings. The values given in 1800 and the dimensions of houses and barns indicate that the farm buildings then compared favorably with those of today. Of the 385 barns of which the dimensions were given, 130 were 40 to 60 feet in length, with usual widths of 20 feet or more, exclusive of sheds. The farm tracts in 1800 averaged nearly 300 acres in size; there were an estimated 60 acres of cropland per farm, with the remainder in pasture and woodland. Other counties of the Piedmont area have similar land-use histories.

Over much of the uncultivated Piedmont and mountain areas, considerable acreages are too steep and rough for cultivation. Clearing and improving for permanent crop use of many steep slopes has not been successful, owing to the system of farming and the resulting erosion. Clearing and improving for crop use, also, has not been possible over wide areas, because of the cost and the physical obstacles to farming.

Another example of the land-use adjustments being made in the South by land clearing and abandonment is shown by a progress report on farm classification and analysis in the Tennessee Valley counties of Mississippi, by Otis T. Osgood, of Mississippi State College, in July 1948 (*37*). This report mentions the following, among other tendencies in land use in the area. The steeper and more eroded land is being returned to pine woodland uses. Further clearing of woodland is on the low, wet land suitable for corn, hay, and pasture. The land-use pattern is being determined through long-continued trial and error of farmers in finding uses giving the highest net returns from the different kinds of land.

A major management problem in the area is controlling erosion and increasing production on land that in present and prospective use and price situations will tend to remain in cotton production until it returns to pines. Winter cover crops seem to be an important part of the solution.

Opportunities for further farm expansion on land not in farms in northeastern Mississippi are limited as to extent and type of farming. Only about one-fifth of the land is nonfarm land. It is located in the most rugged and highest parts of that country. Land suitable for crops is scattered in small blocks here and there.

The examples cited in North Carolina and Mississippi indicate that the large acreages in row crops, on sloping, erosive land, without winter cover, in the hill country of the South have caused a high toll in erosion and loss of income. Abandonment of eroded and depleted land to woodland growth and reclearing it years later for crops has taken much of the farmers' time and income, and frequently has meant an insufficient living. If all cost and loss is included, the sum is probably several times what it would have cost to follow systems of land use and farm practices which would have kept the level and moderately sloping land continuously in crops and pasture and left the steep land in forest.

Clearing and drainage possibilities—Much suitable undeveloped land, however, can be brought into cultivation or pasture in the Southeast. The upper Southeastern States are estimated to have roughly 2 million acres of undeveloped land that could be drained and cleared at a reasonable figure—approximately 170,000 acres in Kentucky; 1,157,000 acres in North Carolina; 242,000 acres in Tennessee; and 514,000 acres in Virginia (*33*). Depending upon economic conditions and the pressure for land in these States, probably many acres will be cleared and drained in the next 10 to 15 years.

Perhaps an additional 2 million acres suitable for cropland but not now in cultivation could be cleared for farm use in Tennessee, but soil fertility is by no means uniform, nor adequate over the entire area. In the Cumberland Plateau about 750,000 acres of woodland are held largely by nonfarm owners in reasonably large blocks of fair-to-good quality for the area. The land of Cumberland County, except for the valley and cove area, generally is presumed to be fairly representative of the Cumberland Plateau as a whole. A recent survey divided the land into five classes. It was found that approximately two-fifths is suitable for cultivation; one-tenth is suited to pasture or forest; and one-half for forest only (*34*). Maury, Giles, Williamson, and adjacent counties contain some 20,000 acres of strip-mined phosphate lands which might be leveled for farm use, but at considerable cost (*33*).

A report published by the Soil Conservation Service in October 1948 on results of a drainage survey in the Jasper Soil Conservation District of South Carolina shows that 150,000 acres of land not now cultivated is suitable for farming if drained and cleared (*72*). Estimated costs of clearing average $55 per acre after deduction of salable timber values; costs of drainage average about $40, and other costs $10, making a total development cost, including both public and private, of $105 per acre. In addition to the new land which could be brought into cultivation by drainage, about 40,000 acres now being farmed would be improved.

Information from this survey is applicable to similar areas of the lower Coastal Plain of Georgia, North Carolina, and South Carolina. When changes in land use are made in the Coastal Plain following drainage and flood-control measures, it is estimated by the Soil Conservation Service that 5¼ million acres can be brought into more intensive agricultural production.

Land improvement on this scale in the Southeast would do much to increase the size of numerous farms that are now too small for a satisfactory living and would furnish opportunities for farms to many tenant farmers of the region. Land in the Coastal Plains of the Southeastern States doubtless will be drained and cleared eventually, principally at first to enlarge inadequate farms. Few major developments are in progress in this area at present.

From a report on land development in Mecklenburg County and other nearby parts of the Virginia Piedmont, it appears that there are few good opportunities in this area for the creation of new farm units of economic size and acceptable character (*11*). Large reaches of the idle and forested land, apparently underutilized, might be more fully used by existing farm units for diversified field crop, livestock, and timber production. This would result principally in enlargement of undersized farms through development of woodland suitable for cultivation, in a shift from strictly cash-crop to more diversified production, and in protection and management of woodland for timber products. Although substantial acreages of woodland are potentially adapted to farming in other counties of the southern Virginia Piedmont, their availability to new farmers, and their comparative use advantages, appear to be similar to those for Mecklenburg County.

Another study in the lower Coastal Plain, centered in Jones County, N. C., reveals that there is some undeveloped land suited to farming. Much of it is held as an investment. Nearly two-thirds of all farmers in the county are tenants. Drainage improvement is needed over wide reaches, but public assistance will be required to carry it out successfully on a large scale (*32*).

Drainage in many coastal plain localities of Virginia and North Carolina has been too expensive for the individual small farmer (*12*). And because extensive acreages of undeveloped land have been held by owners as investments at prices comparatively greater than for developed land, farm development has been delayed. When the cost of clearing and draining is considered, some owners figure the land is more valuable for growing timber than for cultivated crops. Soil resources over much of this coastal country need building up by the addition of fertilizing materials. Transportation in the country away from main highways offers some limitation to wider development. Many present farms are too small or contain too little good cropland for economic operation. Much of the available undeveloped land is needed to enlarge such farms.

New Land in the Mississippi River Delta

EXPANSION IN CROPLAND

According to the forest surveys made about 1932 to 1940, the Mississippi River Delta was one of the chief areas in the Southern States where new cropland development substantially exceeded land abandonment. In northern Louisiana and Mississippi, and in northern Arkansas the land development in Delta areas was 2½ to 3 times the rate of land abandonment. In southeastern Arkansas and southern Louisiana land development and abandonment were about equal. Figure 4 shows areas in the Southern States, where (1) new cropland development exceeded land abandonment, (2) new cropland development and abandonment were about equal, and (3) cropland abandonment exceeded new cropland development.

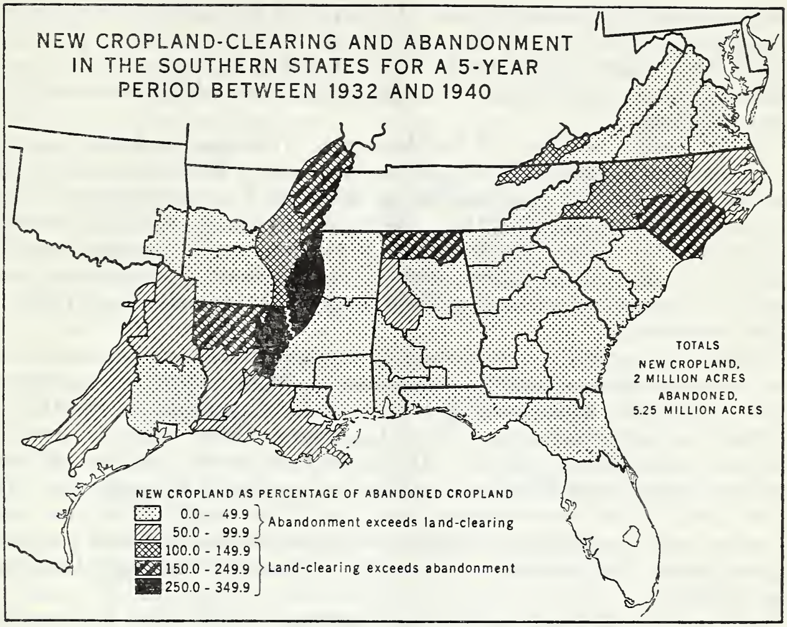
NEW CROPLAND-CLEARING AND ABANDONMENT IN THE SOUTHERN STATES FOR A 5-YEAR PERIOD BETWEEN 1932 AND 1940
TOTALS
NEW CROPLAND, 2 MILLION ACRES
ABANDONED, 5.25 MILLION ACRES
NEW CROPLAND AS PERCENTAGE OF ABANDONED CROPLAND
0.0 - 49.9
50.0 - 99.9
Abandonment exceeds land-clearing
100.0 - 149.9
150.0 - 249.9
250.0 - 349.9
Land-clearing exceeds abandonment

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FIGURE 4.—New land clearing goes on almost continuously. The highest rate of land clearing is in the Mississippi Delta. In some parts of the Piedmont and other sections new development about balances or only slightly exceeds abandonment; in other parts abandonment exceeds clearing.

The data from which this map was constructed were taken from several of the published reports of the Appalachian and Southern Forest Experiment Stations of the Forest Service (*61*).

In Louisiana, the largest blocks of remaining undeveloped land lie in the northeastern part of the State between the Mississippi and Ouachita Rivers and in the marshlands along the Gulf. Development costs in both areas have a wide range (*21*).

Several thousand acres in the rice areas of Louisiana and Arkansas, particularly around the Cache River in Arkansas, are being cleared and leveled in an expansion movement by established rice farmers. This requires considerable capital. All of this development may not be warranted solely for rice farming after the other chief rice-producing areas of the world get back into full production. Little expansion into the coastal marshes is noticeable, because of the high cost to farmers of building levees and pumping systems.

Sugar planters have been improving the backlands along Bayou Teche, Bayou Lafourche, the Mississippi River, and other areas during the last few years by renewed building of levees and the establishment of small pumping plants. These lands, formerly drained and in cultivation, had largely reverted to swamp in the 1930's. The increase in farm land is not large, but some additional cane acreage will be available.

A few new farms are provided occasionally in southern Louisiana from division by inheritance or from the development of farms in a few partly developed localities. Cultivation has already been pushed to the edges of the swamp in most places, and over southern Louisiana generally further reclamation would involve expensive pumping or other drainage and flood-control operations beyond the means of most small farmers.

In the Delta counties of northeastern Arkansas and southeastern Missouri, there was an increase in the acreage in farms and a considerable increase both in the number of farms and in the acreage of harvested crops from 1940 to 1945. These localities, as a whole, have more improvements, including better flood-control and drainage installations, than some of the Delta counties farther south. Moreover, there has been more promotional activity regarding family-sized farms in these counties.

From 1940 to 1945 in southeastern Arkansas and northeastern Louisiana, and to some extent in northwestern Mississippi, the number of farms declined while acreage increased. Cropland harvested increased in some Mississippi and Louisiana Delta counties and decreased materially in others. The reduction in the number of farms resulted from consolidations, while the increased acreage per farm came partly from consolidation and partly by addition of new land. In some sections subject to flood and drainage hazards there was some retrenchment and concentration on the better and less risky land during the war.

Resumption of flood-control and drainage work since the war has brought about renewed interest in new land development in the Delta. Several thousand acres are being cleared each year. Many acres that formerly were partly cleared are being stumped, drained, and otherwise improved. Thus it is likely that numerous new farms will be developed in these counties in the next few years and many present farmers will clear and drain additional cropland.

In the Delta of Louisiana and Arkansas north of the Red River some extensive forests are being given flood protection and drainage by Federal flood-control projects. These areas saw considerable new settlement in the 10 years before the war. Although soil productivity is not uniform, a considerable acreage of the undeveloped land is potentially suitable for agriculture, but most of it is needed to improve existing farms or to provide new farms to people of the area. There is little room for large-scale settlement by nonresidents without overcrowding the present rural population.

Approximately 9,000 acres of pasture land were cleared in Arkansas aided by the agricultural conservation program in 1944, 18.600 acres in Louisiana, and 9,600 acres in Mississippi (*47*). Few new farms resulted, but many existing small farms benefited from the undertaking. Assistance in land clearing was not given in these States in 1945. In addition to the development work described above, many operators of large farms in the Delta have been adding to their improved acreage by clearing and draining during the last 3 years. Land clearing is especially active in northeastern Arkansas. Several counties are estimated to have had an increase of 15 to 20 percent or more in cropland acreage in the 10 years 1940–49. Numerous farmers have cleared 50 to 100 acres or more each per year. One farmer is reported to have cleared 1,000 acres in 1947.

Both individual and group drainage work has been expanding since 1944. The total drainage work done in 1946 through the soil conservation district program about equaled the 2 previous years combined. Still greater progress was made in 1947 and 1948. Drainage costs have increased and changed because of rising prices and the installation of more complete systems.

Much contract work is being done (both in clearing and drainage), the rates varying in proportion to the work done. Some drainage repair work has cost about $3 or $4 per acre. New open drainage has run higher—$8 to $25 or more, depending on the difficulty of the job. Average rates for land clearing in many instances have ranged from $30 to $60 and even up to $100 or more per acre, depending on the work to be done and the completeness of the job. Bulldozers and other tractor equipment have encouraged clearing and drainage in the Delta as elsewhere. Group drainage and clearing jobs made feasible by machinery also make it possible to get more and better work done. A complete clearing and stumping job for extra large green timber naturally costs much more than clearing average cut-over and brush land where many of the large stumps are dead and the green timber is small.

Further development in the Delta States is contingent upon clearing, drainage, and the reduction of flood hazards, and, of course, upon the costs of development, the amount of land for sale, and the prices and terms of sale. For example, if prices for undeveloped land are almost equal to prices for developed land, few people will be attracted. In the past some buyers who could not get land elsewhere with long-term payment arrangements contracted for unimproved land. Prices and terms of sale by purchase contracts in some instances were not conducive to stable development. Large payments over short periods, while the land was being cleared and drained, were required. If they were not met, the land and improvements reverted to the contract or mortgage holder. Many forward-looking holders of land for sale, however, have recognized the losses resulting to both buyers and sellers from this situation and are offering sound financial terms to prospective buyers.

FUTURE LAND DEVELOPMENT

Thousands of acres of potentially good crop and pasture land in the lower Mississippi Valley can be farmed if they are drained, cleared, and protected from flood and backwater overflow. Much development, particularly clearing and draining, has been carried out by the efforts of individuals and drainage districts, and more can be accomplished. But the extensive drainage and flood-control operations still necessary over large areas will be on a scale too large and expensive for individual or small group undertakings. Until large-scale public reclamation is forthcoming, probably the bulk of any new development will be through private clearing and efforts by local communities both in scattered localities.

In the delta north of the Red River, where some extensive forested lands are being drained and others planned as part of the work in improving flood-drainage channels, it is expected that some 4,000 to 5,000 new farms may be undertaken by 1954. Much of the available undeveloped land is now held by lumber interests. The map of the Bartholomew-Boeuf-Tensas Basin of Arkansas and Louisiana (fig. 5) shows the delta areas from the Arkansas River to the Red River, including part of those mentioned here. Some idea of the magnitude

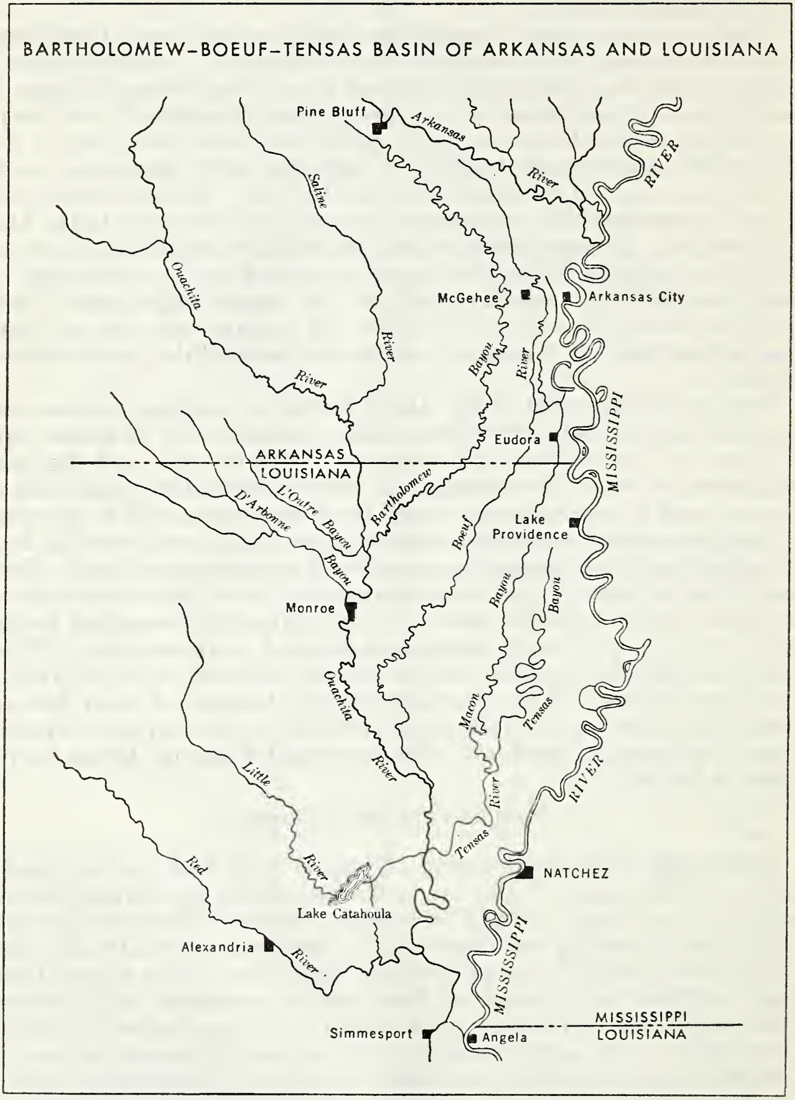

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FIGURE 5.—Shown here are some of the distinctive physical features of the Mississippi River alluvial valley which make this tributary basin a logical unit from the standpoint of flood control and drainage. Major improvements in one part affect the success of drainage and flood-control works in other parts.

of drainage and flood-control reclamations and the problems involved may be gained from the map. In Louisiana, many thousands of acres, now frequently covered by winter and spring floods of the Mississippi and Red Rivers, can be improved for farming if flood-control projects are carried to completion.

In the last 65 years (since 1880), approximately 8 million acres of agricultural land have been developed for farming in the 75 counties of the lower Mississippi Delta. Most of this development was by drainage and clearing of forest lands. Protection from floods has also been influential in stimulating land development. An addition of 5 million acres has been estimated as suitable for farming if flood protection, drainage, and clearing are continued.

For example, a drainage survey for Louisiana in 1946 by the Soil Conservation Service found that about 6.8 million acres of cultivated and undeveloped land not now adequately drained were feasible for drainage. Table 8 contains the summary of this study. The data show that drainage works must be justified, in part, on improvements to land now in cultivation but needing better drainage as well as development of new lands for crops. Land in cultivation requiring additional drainage exceeds the combined acreage of pasture and woods suitable for drainage.

TABLE 8.—*Areas feasible for drainage in Louisiana and selected subareas, 1946* [1]

Area feasible for drainage [2]	Acreage in Louisiana and selected subareas				
	Total	Northeast Delta [3]	South Delta [4]	Red River Delta [5]	Southwest Prairies [6]
	Acres	*Acres*	*Acres*	*Acres*	*Acres*
In cultivation	3, 998, 968	888, 529	1, 218, 855	394, 531	1, 105, 587
In pasture	856, 022	12, 699	256, 825	76, 450	366, 697
In woods	1, 913, 187	860, 917	474, 714	174, 097	139, 984
Total	6, 768, 177	1, 762, 145	1, 950, 394	645, 078	1, 612, 268

[1] Data are from a reconnaissance drainage survey of Louisiana by Soil Conservation Service, 1946.

[2] Includes lands not drained heretofore but feasible for drainage and lands now drained but needing improved drainage; most of these areas have received some drainage. Includes some soils that will be suitable only for rice or pasture.

[3] Includes following parishes: Morehouse, East Carroll, West Carroll, Richland, Madison, Franklin, Tensas, Concordia, Ouachita, Caldwell, Catahoula, LaSalle, and Union.

[4] Includes following parishes: Avoyelles, St. Landry, West Feliciana, West Baton Rouge, St. Martin, Iberville, East Baton Rouge, Iberia, St. Mary, Assumption, Lafourche, Ascension, Terrebonne, St. James, St. John, St. Charles, Jefferson, and Pointe Coupee.

[5] Includes following parishes: Caddo, Rapides, Grant, Winn, Natchitoches, DeSoto, Bossier, and Red River.

[6] Includes following parishes: Acadia, Lafayette, Vermilion, Evangeline, Allen, Beauregard, Calcasieu, Cameron, and Jefferson Davis.

As pastures and cropland for enlargement of many small farms are badly needed, it is probable that any increase there may be in cropland will have to come from the clearing of woods. This clearing is now going on and will continue for many years. In any case, it will take several years for the benefits of drainage in undeveloped districts to be realized in earning power of the land. Benefits to already cleared and farmed land must support the program in its early stages, but this fact should not overshadow the very great long-term values in the drainage work now going on under several State and Federal agencies.

In the Mississippi Delta and along the Gulf Coast, drainage enterprises cover a considerable extent of land not yet included in farms. In Louisiana, the high proportion of land within drainage districts but not in farms is largely accounted for by the relatively wide coastal marshes which lend themselves to drainage only in places. Although farming activities can be expanded here by appreciable acreages of good land, it is doubtful that they feasibly can reach the high proportions of land reported in crops for the Upper and Central Delta with the generally more favorable soils and topography for natural and artificial drainage.

In all cases it should be remembered that drainage of lowland for crops is expensive. It should not be undertaken without careful study of the physical factors, such as soil fertility and ease of cultivation; and the economic factors, as costs, market needs, and returns. Some wet lands, particularly marshlands, are valuable as the home of wild life of economic value. The muskrat trapping industry in Louisiana is valued at several million dollars a year, for example. Many lowland areas have use as hunting preserves, and as game refuges.

SPECIAL PROBLEMS IN LAND IMPROVEMENT IN THE DELTA

As explained, in the thousands of acres of potentially good land that can be developed for farming in the lower Mississippi River Valley, much of the clearing and drainage can be done by individual farmers, but the bulk of the reclamation would be area-wide and must await public action. Organized area-wide public works are necessary, especially flood-control structures and drainage outlets (*21*). Recent experience of farmers in drainage districts in the Delta has disclosed some of the problems that are likely to confront new settlers as well as present farmers.

Many settlers have set up new farms in the Yazoo River backwater country. Records of the Field Service Branch of the Production and Marketing Administration show that 874 new farms, 40 to 80 acres in size, were established during the period 1934–40 (*31*). Approximately 700,000 acres of cut-over Delta land suitable for farming are still undeveloped for agricultural use.

Floods have become less damaging as more effective flood-control measures have been installed along the Mississippi River, but flood and drainage problems still face new-land farmers, especially in places of low elevation and heavy clay land. Hazards of flood damage in the backwater country vary greatly, ranging from almost none at high elevations to very severe in the lower parts. As the frequency of floods is directly related to elevation and as the possibility of flood damage increases rapidly as elevation declines, land-use patterns and extent of agricultural development have been influenced greatly.

Although about two-thirds of the floods come during the crop season, there are wide variations in the date of occurrence. Consequently, the major part of flood damage in the backwater country results from the reduction of incomes during years when floods prevent the normal planting and harvesting of crops. On flooded cotton and corn farms, for example, by the time floodwaters have receded it is often possible to plant only some alternative feed crop which will bring in only a small income.

In some years, damage may be very slight or there may be none at all. But if only annual damage is considered, the importance of floods in the area is not fully apparent. Losses are not distributed on an annual basis, but occur at varying intervals, and thus are more serious to the small farmer than a regular loss of a smaller degree each year.

Cost of development is apparent from further analysis of settler experience. In nine Delta counties and parishes of Mississippi, Louisiana, and Arkansas, 37,500 acres were cleared between 1930 and 1940, and 1,500 new farm settlers from the area or nearby areas took up residence on 67,500 acres of undeveloped land. These farmers bought about 45 acres each at an average price of $28 per acre. Clearing costs, as estimated by them, averaged $17 an acre for removal of brush and small trees and girdling the large trees. The stumps and large trees were left for removal after decay and wind had taken their toll and made the work easier. For 80 percent of the undeveloped lands thus settled, drainage was necessary in addition to clearing, its costs averaging $7 to $8 an acre for secondary drainage works and $1 to $2 an acre for farm drainage works, depending upon the farm and its location. Considering only these minimum costs, to buy and prepare uncleared land for production meant an outlay of $65 an acre at prewar prices (*28*).

In addition to these costs of land and development, farm buildings were necessary. Then frequently, a farmer had to cut and build private roads through woodland to reach his land, and to help his neighbors in building and maintaining farm roads and bridges to furnish outlets to county and State highways.

In Mississippi County, Ark., 150 local farm families bought individually a total of 17,500 acres of cut-over forest from a lumber company, in the 1920's. With improvements, the cost of the developed farm land has been around $100 an acre—$60 an acre with no improvements. The family holdings average 135 to 150 acres. The economy of the area has centered around cotton principally, but each farm unit was diversified as clearing progressed. The success of the new farm undertakings is apparent from the fact that much of the cost had been paid off and both physical and financial farm inventories in 1942 were in good shape. In 1942, no land was for sale (*6*). Part of the success of these settlers may have been due to the assistance of the lumber company in helping to handle financial problems, but much more was due to the ability of the settlers themselves in selecting good land and managing it well.

The future for small farms in the parts of the Delta that are adapted to large-scale farming is probably as closely associated with size of business and related living problems as with physical problems of soil and land reclamation. An outstanding problem lies in the economic necessity on certain soil and elevation sites for developing farming systems that are adapted to the area and involving large units with considerable investment in machinery (*31*). Drainage and flood control are going ahead rather rapidly, but as in parts of the Corn Belt and other commercial farming areas where large farms are customary, the small farmers in parts of the Delta have business and other disadvantages. With mechanization of cotton production going on, the small farmers wonder what they can do to get use of the new machinery. The future for a large permanent expansion of small farms in the Delta appears less certain than the increase of medium-sized commercial farms.

Texas and Other South Plains Areas

Clearing of brush land and cedar and semiarid woodland, has been a land-improvement practice in Texas for several years. Apparently there has been an increase in clearing such land, for acreages reported as nonforested pasture and grazing land have had a noticeable increase in the State.

A great deal of the land that is being cleared of brush is going into cultivated crops in the southern part of Texas. Most of this development centers in and around the Corpus Christi area, and in the three counties that comprise the lower Rio Grande Valley. In April 1948, it was reported that more than 100,000 acres of such land had been brought under cultivation in Willacy County alone in the last 3 or 4 years. Methods of clearing have reached such efficiency that costs are approximately the same as before the war, despite the increase in prices.

In the Coast Prairie, there is interest in the development of improved pastures. This development involves drainage, breaking, seeding, and fertilizing. It seems to have possibilities. Owing to the high prices that have prevailed for livestock, there has been considerable brush clearing and other such development, leading to improvement of grazing in many parts of the State.

Drainage activities are mostly concentrated on the alluvial lands of the chief rivers, their lower tributaries, and the Gulf Coastal Plains. Lands subject to reclamation in these lowlands are so extensive and drainage enterprises are so complex that land development has not reached its full potentialities. For example, only about two-thirds of the land in drainage enterprises in 1939 was reported to the census enumerators as drained enough for crops. Improvements of much more land by drainage is possible.

There has been a significant increase in the ranch lands being developed into farms. For instance, some 40 sections lying mainly in the northeastern part of Hockley County, have been cleared, subdivided, and sold off into farms averaging some 400 acres. Considerable acreages of open grassland and pasture land have been plowed for wheat in some of the western counties.

Some farm improvement has taken place in eastern Texas and new houses have been built around industrial areas, but there are few entirely new farm units. On the other hand, extensive abandonment of cropland to weeds, pasture, and woodland growth has occurred in recent years in many parts of eastern Texas. Much of this abandonment has been in places where large-scale oil and gas wells are being developed or other industrial operations are going on. Land has been abandoned for cultivation because of poor soil and erosion as well as because of the availability of other work that paid better.

Available information indicates that little actual new farm land has been developed in Oklahoma in recent years. Most of the work has been in the nature of improvement of acreages already in cropland and pasture. Both abandonment and conversion of cropland to pasture have occurred in eastern Oklahoma. Many acres of land converted to pasture have been limed and seeded. Some pasture land has been plowed up, but most of the additional acreage of wheat in Oklahoma in the last few years, has been obtained by reduction in other crops, or of fallow and idle land on going farms.

Land Clearing, and Drainage in the Pacific Northwest

CUT-OVER CROPLAND

Cropland in Washington, Oregon, and Idaho, that has been developed by clearing off forests probably totals about 2½ million acres, or 15 percent of the land available for crops. Additions by clearing have exceeded abandonment and this is expected to be the case in the next few years. Net additions to cut-over cropland by 1960, in the three States, were estimated in a recent study at approximately 250,000 to 365,000 acres under conditions of moderate or full employment, respectively. This would be a gain of 10 to 15 percent in cropland of this type. Approximately three-fourths of this gain will probably be in Washington and Oregon, west of the Cascade Mountains and most of the remainder in northern Idaho and northeastern Washington. This type of development was rapid during the period 1943–47.

Undeveloped land can be bought in western Oregon and Washington (*38*). It is generally in need of clearing. Much of this clearing work can be done by the farmer at varying costs, but unless the soils are suitable for farming, it will cost more to clear the land than it will be worth when cleared. For example, in 1940 using the bulldozer, total clearing costs to the individual for very easy jobs averaged $18 an acre; for easy jobs $39; medium jobs $57; and difficult jobs $80 an acre. Others ran as high as $200 an acre for clearing heavy timber and large stumps, depending upon what needed to be done (*44*).

The importance of the land cleared of woodland growth is indicated by the acreage developed under the agricultural conservation program. In 1946 approximately 28,000 acres of farm land and pasture were cleared in Washington and 14,000 acres of farm land and pasture were cleared in Oregon (*47*). Acreages reported as cleared and cleaned, in this program for 1944 and 1945 for these two States, also were rather large. Farm clearing not under the conservation program has been going on also and some land has been cleared for nonfarm use.

In nine Western States, where clearing was one of the adopted agricultural conservation practices, approximately 70,000 to 125,000 acres were cleared each year from 1944 to 1946. From 8,000 to 12,000 farms participated in the land clearing each year, thus indicating an average of 8 to 10 acres cleared per farm.

Shipbuilding and other war industries, in California, Oregon, and Washington, attracted many persons who liked the coast area enough to buy land on which to establish homes—some on full-time farming units, others on part-time units near urban employment. This trend and the effect of the long-time movement of people to the west coast is shown in the returns of the 1945 Census of Agriculture. In nine western Washington counties, the number of farms increased 8 percent from 1940 to 1945, while in 12 northwest Oregon counties the number increased 3 percent during the same period.[4] Cropland in these counties increased 6.8 percent, while cropland in the 12 Oregon counties increased 2.3 percent.

DRAINAGE AND DIKING

Most of the drainage developments likely to be undertaken in the Pacific Northwest by 1960 probably will be for the improvement of land already used for crops. Estimates of new cropland that will be made available by drainage and diking in the three Northwestern States, by 1960, range from about 15,000 to 25,000 acres under conditions of moderate or full employment, respectively. Most of this will be in the coastal country of Washington and Oregon, with a small extent in northern and southwestern Idaho.

PART-TIME FARMS

During the war, many people bought small acreages of undeveloped land near industrial centers in the Northwest for establishing farms with the idea of enjoying country life and at the same time of making their future more secure.

For success in part-time farming in any area considerable off-farm employment must be available nearby, and of a kind that will provide work for several years. As in other such periods, if work decreases, many farmers will either have to leave their holdings to get work elsewhere, or will depend upon public assistance.

But for those who have assured possibilities of reasonably substantial, off-farm income there are opportunities for establishing rural residences or part-time farms on accessible and otherwise suitable undeveloped land. These farm units can be used to supplement income that otherwise might be inadequate.

Land for part-time farming should be on an all-weather road and of reasonably good quality, and the climate in general should be suitable for gardens and the ordinary crops of the area. It is well to remember that frequently before a satisfactory part-time farm can be developed, the land must be cleared of trees, brush, and stones, and adequate water must be obtained for domestic use and often for watering gardens, fruit, and truck crops.

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[4] Whatcom, Skagit, Snohomish, Clallam, King, Mason, Pierce, Thurston, and Lewis Counties, Washington. Clatsop, Columbia, Tillamook, Washington, Multnomah, Clackamas, Yamhill, Marion, Polk, Lincoln, Benton, and Linn Counties, Oreg.

DRY FARMING

Large reaches of land in the Great Plains and the Pacific Northwest receive insufficient rainfall for the successful growing of any harvested crop other than small grains, but many of these acres are farmed regularly. The general practice on this land is to grow small grains (principally wheat) every other year, fallowing the land in alternate years. In periods when the rainfall is above normal, the proportion of years that grain is grown is sometimes increased, particularly if prices for grain are favorable.

Several million acres are dry farmed intermittently in grain. This land has less dependable precipitation or the soil is poorer than the land cropped regularly. In years of abundant rainfall it sometimes produces large grain crops that bring a high return to the farmers, as tillage costs are low with the large-scale equipment now in use.

In the past, most of this land has once or more been abandoned or returned to grazing because of scant moisture, or low prices for grain, or a combination of the two. During the early nineteen thirties when both moisture supplies and grain prices were unfavorable, taxes were allowed to go delinquent for several years on much of this land and some of it was forfeited to the local governmental units for nonpayment of taxes. By 1946, there had been five successive years of favorable moisture and prices for grain were advancing. As a result, nearly all of the land was in private ownership and was again producing grain and the taxes were paid.

In the Great Plains alone 5 million acres of grazing land were plowed for wheat, mainly in the last 4 years. In the same period 2 million acres of cropland were returned to grass. A conservation survey found that much of this plowed grassland is unsuited to continuous cultivation because of the hazards of low precipitation and wind erosion.

The use of modern, large-scale equipment makes it possible to conserve moisture by covering large acreages in the short time when soil-moisture conditions are favorable. Costs per acre of growing grain are also lower with the large-scale tractor-drawn equipment than with horse-drawn, because labor is drastically reduced.

These developments are likely to mean that farmers will keep more of this marginal type of wheat land in production than has been possible in the past. An offsetting factor is the destruction of soil that has taken place on some land by wind erosion. Under normal conditions less of this land would be cropped than was the case in 1946.

Dry-land grain lands have had a declining farm population for several years. When grain prices are high, large operators with mechanized equipment expand their planted acreages; when prices are low they reduce them. "Suitcase farmers" move in for a few crops, too, when prices for grain appear profitable. This expansion occurs on both owned and leased acreage. When no longer profitable in grain, this marginal grain land is allowed to lie idle, grow weeds, and eventually return to grass and grazing, between the periods of use for grain.

Other Undeveloped Lands

Other scattered areas of undeveloped land in many parts of the country have both possibilities and limitations for farming. Some lands which have reverted to public ownership because of failure of the private owners to pay taxes are occasionally for sale by counties or States. Completely undeveloped land may be found in most of the parcels, although some of these abandoned properties are run-down farms with buildings in disrepair. The fact that they were abandoned or lost for taxes would suggest that they might not be worth the cost of redevelopment, although there may be exceptions. Without development of some kind, few States or counties consider such property suitable for agriculture except as additions to going farms, and many counties have zoned it against year-long residence because of its location, soil type, or other shortcomings.

Here and there some publicly owned land is being offered for sale or for homesteading by veterans. In Florida, veterans of World War II who are citizens of the United States and residents of the State have been given the right to homestead up to 40 acres of wild and vacant State land if it is certified as satisfactory for cultivation. Before a deed can be issued, homesteaders are required to live permanently on the land for 3 years and to improve the land during that time. (*15*). Some State-owned lands in Washington have been offered to veterans recently, although experience of farmers on similar land has not been entirely satisfactory (*52*).

Occasionally some States sell a few undeveloped parcels of State school lands, grants of earlier days, or land held out of agricultural use for possible public forest, recreational, or other use. Although neighboring farmers as a rule can buy such land to best advantage, particularly if the acreage for sale is small, there is a possibility that others could acquire it.

Some undeveloped surplus military and naval land is being sold, and more possibly will be sold under a priority schedule established by law. By June 1948, about 1,600,000 acres, classified as agricultural and forest land, had been declared surplus and 994,030 acres had been assigned to the Farm Credit Administration for disposal. Of this total, disposition had been made of 626,735 acres by June 1948. Former owners were the most important buyers, taking 61 percent of the land sold (*59*). This acreage does not include the public grazing and forest land transferred temporarily to the national defense departments during the war. More than 9 million acres of this land have been restored to the former administering agencies, such as the Bureau of Land Management and the Forest Service. Farmers have leased much open military land (which was acquired from private landowners) when not currently used for military purposes. In 1944 nearly 378,000 acres and in 1945 about 896,000 acres were leased to farmers; the leased acreage was close to 1,150,000 acres in 1946, when many areas were designated as surplus or "stand-by" (*29*).

Any such surplus land not sold under established priorities will be available for sale to the general public—veterans are fifth in order of priority, three places ahead of the general public. Public notice is given in advance of the disposal of each area; the notice lists the address of the district or local office of the Farm Credit Administration which handles sales.

Many individuals and real-estate dealers the country over have parcels of undeveloped land for sale. Most of this is privately owned and can be obtained only through individual purchases. Public lists of land for sale are not generally maintained. Accordingly, the would-be land buyer must look carefully for suitable land. Not all land offered for sale can be economically developed for family farms, but some good tracts can be found if judgment is used in the selection.

The Increased Acreage in Farms

As reported by the 1945 Agricultural Census, farm acreage was much larger than formerly in some States, notably Montana, Nevada, and other Western States, because considerable range and grazing land was reported as "land in farms" for the first time. The actual use, status of improvement, and ownership of much of this land have not changed. Most of it was, and still is, grazing land. About half of the grazing land is owned by ranchers or is leased from private sources, and about half is obtained from State and Federal agencies under leases or permits. Along with the greater public interest and with the increase in value of grazing land more definite arrangements have been made for use of many scattered holdings of both private and public land than formerly. Consequently, much more grazing land is now reported as part of farm or ranch operating units than in the past.

The large increases of land in farms in the Western States principally represent grazing lands which formerly were open range and grazed without definite arrangement, or were grazed under permit, but are now operated on a lease or individual-permit basis. For example, lands leased under section XV of the Taylor Grazing Act probably were mostly included in farms. Large acreages of Indian and State and county, railroad, and other lands, also were leased or used under some form of agreement and were included in farm acreage. In some States, much Indian range land was reported by the Indian operators as land in farms instead of as formerly in tribal holdings. The distinction between lands to be included and those to be excluded in the 1945 census was determined mainly by whether the operator had control of the land used. Accordingly, the reported change in total acreage of land in farms represents merely the inclusion of land used for agricultural purposes which heretofore had been excluded.

PROGRESS IN IRRIGATION

Extent of Irrigated Acreage

The 1945 Agricultural Census found that the total harvested crop and pasture land actually irrigated in the United States was approximately 20.5 million acres. This was an increase of 2.5 million acres, or nearly one-seventh more than the 18 million acres of harvested cropland and pasture irrigated in 1939. Much of this increase was in the Pacific and Mountain States, made possible by greater water supplies, and on the high plains of Texas, made possible by irrigation from wells.

The total irrigated acreage supplied with water from Federal irrigation projects increased more than on other projects, being over a million acres, or nearly one-fourth. The figure rose from 3.1 million acres in 1940 to 4.2 million acres in 1945 (*71*). A total of 91,662 irrigated farms was reported for 1945 on all Federal reclamation projects, including those areas that were served a partial supply as well as those that were furnished a full water supply.

The irrigated acreage increased, owing to availability of water and increased planting of irrigable land. Better prices and favorable weather and greater water supplies were other influences in the increase of acreage. Much irrigable land in project areas that formerly lay fallow, idle, or was dry farmed or pastured was irrigated during the war, thus increasing the production. New acreage probably accounted for one-fourth to one-third of the increase in Federal projects.

Cropland leveled for irrigation in the Western States reported in the agricultural conservation program was 195,000 acres in 1944, 275,000 acres in 1945, and 482,000 acres in 1946. An average of about 40 acres was leveled per farm carrying out the practice. Much of this land had been previously farmed—either dry farmed or irrigated—although a considerable acreage was new cropland. It included also some land that had been poorly leveled the first time and was leveled again. Sometimes after a year or so of farming it has been necessary to relevel land to avoid erosion and excessive use of water.

Irrigation in Texas and Oklahoma

SURFACE-WATER IRRIGATION

In the lower Rio Grande Valley 450,000 acres are under irrigation. With investigation and work under way it appears that water will be available for a total acreage of about 700,000. As nearly all the potential acreage is now under operation, the prospects for new farms are limited. Over 100,000 acres more were irrigated in 1947 than in 1943. Much of this land was already improved and did not represent new development. The acreage that utilizes surface water varies somewhat from year to year, but this is largely attributable to variations in the supplies of water. Observers have estimated that about 10,000 acres of new land were cleared per year during the last 3 years. One area of 10 sections was cleared and leveled.

A large block of land in Calhoun County, Tex., is being developed for rice irrigation. Within 2 years more than 20,000 acres have been brought under irrigation. This is an example of development in the rice area and in other Texas counties lying east of the high plains. In Oklahoma only comparatively small reaches of new cropland have been added by irrigation as most of the land brought under water has been old cropland. The Lugert irrigation project near Altus, Okla., has been of this nature. The well irrigation in the northwestern part of the State, concentrated in Beaver and Texas Counties, has been on cropland.

GROUND-WATER IRRIGATION

Irrigation has been expanded on the high plains of Texas recently, where formerly the limited rainfall was depended on for moisture.

An inventory of well irrigation in Texas made by the United States Geological Survey and the Texas State Board of Water Engineers shows several thousand new wells in the high plains alone. Some idea of the increased ground-water use can be obtained from the inventory of wells of Lubbock County, Tex. In December 1945 there were 560 wells in this county; in November 1947 more than 1,300 wells were being used. Like increases, although possibly not so large, have taken place in other counties.

Irrigation on the high plains of Texas is reported to have increased from about 300,000 acres in 1943 to 960,000 acres for the 1947 crop year. Preliminary estimates for 1948 set the acreage around 1,350,000. Development of new wells on the high plains now appears to have slowed down somewhat from the high rate of 1947. Indications point to a declining water supply. Most of the increase for 1948 resulted from wells drilled late in 1947 or early in 1948, as drilling was at a reduced rate during the summer and fall.

Only a few new farms are resulting from this increased irrigated acreage. Within the last 2 years, particularly in Floyd, Lubbock, and Hale Counties, a few of the large farms have been subdivided. Until the last year or two, however, mechanization has tended to offset intensification of farming activities due to irrigation. Most farms have remained large or the size has been increased since the advent of irrigation.

There also is widespread irrigation activity in the Trans-Pecos area. Developments within the last 2 years total approximately 70,000 acres, and they are continuing. Practically all of the new acreage is in new farms of 160 to 200 acres. The cost and the extent of land that can be served by one well tends to set the pattern. Potential development is limited by the quantity of water available. As the development is so recent there is no sound way of estimating the potential development.

PLANS FOR IRRIGATION IN THE NORTHERN PLAINS

Further development of any considerable acreages of cropland in the Northern Great Plains[5] depends largely upon the supply of water, the amount of public reclamation assistance, and the demand for products of the area.

Authorization for extensive public irrigation projects has been approved, and construction delayed by the war is being completed.

Quality and productivity of land resources in the Great Plains States are by no means uniform. The average value of agricultural production per acre in each county of the seven Plains States of the Missouri Basin, for the period 1924–43, is shown in a publication by Ralph E. Ward and William A. Green, Geographic Differences in Production from Agricultural Land, Northern Great Plains (*76*).

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[5] North Dakota, South Dakota, Nebraska, Kansas, and parts of Colorado, Montana, and Wyoming, in the Missouri River Basin.

The counties were classified according to a production index with the regional average production from agricultural land as 100. The index was constructed by combining average crop production for 1924–43 and estimated average grazing capacity on the bases of their relative values at 1935–39 prices.

Counties with a production per acre that was more than 50 percent above average, with some exceptions are located in the eastern part of the region. These counties contain 24 percent of the agricultural land and accounted for 56 percent of total agricultural production. Counties with a production more than 50 percent below average occupy much of the western part of the region. Although the counties contain large acreages of cropland and considerable reaches of irrigated land, this is outweighed by large tracts of grazing land, much of which is of low grazing capacity. The group contains 42 percent of the acreage of agricultural land but accounted for only 13 percent of the value of the agricultural production in the 20-year period.

Many farms and ranches of the Plains have been considered to be too small, so instead of available acreage going into new farms it has been used to enlarge existing units. For instance, in groups of counties in northeastern and southwestern Nebraska and south central South Dakota, returns from the 1945 census indicate that the number of farms declined from 1940 to 1945, while the cropland and grazing land increased.[6] It is probable that the farmers in these areas were enlarged during the last few years by operators who acquired or rented the land of others nearby, and who leased or obtained permits to use Indian and publicly owned land; and that land developed by irrigation, or by plowing of grazing land, or by other means, was mainly that already within farm boundaries.

Most of the land in Kansas is in farms. Opportunity to increase production lies principally in changes in the present use of land. One change could be the conversion of pasture to crops, as was done during the war period; however, rotations need more grass and legumes. Perhaps one of the promising ways to expand agriculture is through irrigation, both ditch irrigation and irrigation from wells. For illustration, in Scott County the number of wells has nearly doubled in the last 5 years. It is probable that an increase will continue, up to the limit of the water supply, so long as many farmers have money to make the necessary investment in equipment and preparation of land for irrigation.

Extensive development of the Missouri River Basin has been proposed as one of several coordinated Federal and State plans for achieving stability of agriculture in the Plains States. Initial construction has been authorized for some units. This development would utilize water resources, by construction of reservoirs, pumping plants, and main irrigation ditches that are too costly for individual undertaking (*64*).

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[6] Knox, Cedar, Wayne, Stanton, Cuming, and Burt Counties in northeastern Nebraska; Scotts Bluff, Morrill, Garden, and Banner Counties, in southwestern Nebraska; and Hughes, Buffalo, Jerauld, Sanborn, Lyman, Brule, Aurora, Davison, Hanson, Gregory, Hutchinson, and Yankton Counties, in south central South Dakota.

The area of the Missouri Basin is about one-sixth that of continental United States. Within the Basin are 100 million acres of privately owned tillable land—of which more than 5 million are irrigated; more than 145 million acres of privately owned grazing land; and about 75 million acres of publicly owned grazing land (*64*).

In all, proposals have been made for ultimate irrigation of 6 million acres of land not now irrigated, and for furnishing a supplemental water supply to some 1,500,000 acres now inadequately irrigated (*64*). This development will in general be in the Eastern plains in three locations—central South Dakota, northwestern North Dakota, and in relatively moderate-sized blocks and strips along the lower Platt River Valley of Nebraska and several other tributary streams. Distribution of irrigation water in canals and maintenance of year-round flows in some streams that ordinarily go dry in summer will relieve water shortages and improve ground-water supplies. Construction of 29 units approved for initial work within the basin is expected to bring irrigation service to about 2,900,000 acres (*57*).

The irrigated area in the Missouri Valley increased nearly fivefold between 1889 and 1939 although irrigation was practiced on only 12 percent of the farms in 1939, and slightly less than 7 percent of the harvested cropland was irrigated (*45*). The function of irrigation differs in different parts of the basin. In some places grain crops cannot be grown sucessfully without it; in many others 90 percent or more of the crops can be so grown. Thus in the eastern counties irrigation may increase crop yields in most years by modifying seasonal dry periods. In fact, some yield ordinarily can be produced in years of very low precipitation. It is in this eastern area, especially, that many problems arise when payment of project costs is being arranged. In many of the western counties, irrigation is necessary every year if hay and other field crops are to be produced.

Ten Federal reclamation projects for which historical data are available are in operation in the Missouri Basin. Their development has been spread over a period of years. By 1944, for the 10 projects as a whole, 72 percent was under irrigation. Many factors have been responsible for the slow rate of development. A few are outlined here (*45, 46*).

Because of inadequate classification of land on some projects, land not suited to irrigation farming was included.

Farmers were unskilled in irrigation techniques.

Lack of provision for drainage resulted in accumulation of alkali salts in spots and in waterlogging of otherwise suitable land.

Too little attention has been given to proper clearing and leveling of land and in design and financing of irrigation and drainage layouts and structures on individual farms.

Limitation of water supplies at certain times prevented the irrigation of more land, or limited the use of the water to crops that do not use much water.

Because of climate or soil, economic opportunities for settlers were limited by adaptability of crops.

In some periods there was a shortage of well-qualified settlers, so that some projects made a poor start and had financial and administrative difficulties.

In other instances land was developed slowly because of high prices for land brought about by extensive speculation which usually involved unimproved range land and dry-farmed land.

Easily constructed and low-cost irrigation projects have been built and natural stream flow has been fully appropriated on many streams. There is not enough water to irrigate all the suitable land even if it were feasible to build the necessary structures and canals. Most of the land must depend upon natural precipitation.

Much remains to be done in parts of the Missouri Basin in classification of land, study of adapted types of farming, and making engineering surveys, before it will be known definitely how much land can be irrigated successfully and economically. For example, surveys in the Missouri-Souris unit show that certain glaciated sections have numerous little mounds, low ridges, uneven slopes, and small unconnected depressions. The problem of leading ditches through a countryside of that sort, and leveling the land and spreading the water, is a serious one. It requires careful study of land classes and topography (*58*).

The largest part of the land in the upper Missouri Basin is in range use. Much is dry-farmed in wheat and so has been withheld from plans for immediate participation in the distribution of water. Probably more will be included in irrigation projects later.

Irrigation Development in the Mountain Region

In the Mountain States several public irrigation facilities have been completed and proposed developments are expected to provide some new farms over a period of years.[7] But recent developments have mostly supplied supplemental water to land already in farms. In a few areas, the practicable limits of expansion have about been reached; the most desirable lands are already in cultivation. In others, the readily available water appears to be appropriated. Drainage and control of floods and sedimentation are needed in many valley areas in the Rio Grande, Pecos, and Gila River watersheds in order to protect and maintain existing farm lands.

In the Southwest, some new-land farms are depending on cotton farming whose profitableness is subject to market demands for cotton. In other areas enlargement of existing farms is necessary if present operators are to succeed financially.

Scattered areas over the region, that are suitable for new or added irrigation, must often depend upon new or supplemental supplies of water. In some instances, available water is not being used as efficiently as it might, because of duplicating ditches and because of overapplication to lands that have primary rights. Elsewhere water is being used for inferior soils while good soils have an inadequate supply (*5*). Irrigation will aid many general and livestock farmers and ranches materially in improving their farm organization, particularly if they can obtain supplemental water for growing livestock feed.

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[7] The Mountain States are: Montana, Wyoming, Idaho, Utah, Nevada, Colorado, Arizona, and New Mexico.

New ventures in irrigation farming should be considered with care before they are undertaken. Often more information is needed about the costs and the benefits of irrigation. There is special need for a careful selection of lands to be irrigated and for technical assistance to beginners in irrigation farming.

Some private development has occurred in Arizona and New Mexico, but water is limited and pumping lifts are great in some areas, so that much new private irrigation is not considered feasible except during extended periods of high prices for farm products. Again, few new family farms have resulted recently from new private projects in the Southwest.

For example, among other areas reported are the new pumping developments in Hidalgo, Torrance, and Lea Counties in New Mexico. Deep wells are being drilled in the Salt River Valley of Arizona to augment the water supply, and in other areas to provide new irrigation. Studies of ground-water basins have been made in Pinal County to meet the requests of soil-conservation districts. Water levels in the wells of this county are 22 feet below their averages of 5 years ago. Under the new Arizona State ground-water code, provisions are made for control of critical areas by regulation of pumping, and curbing the sinking of new wells and opening of unirrigated land (*14*).

Possibilities are being studied for diversion of Colorado River water to supplement existing supplies for approximately 600,000 acres of land under irrigation in central Arizona. Insufficient water is available from the Gila and Salt Rivers and other sources of the immediate area to maintain the entire acreage permanently in intensive cultivation. (*58, 68*)

Among the proposals in the Mountain States is to study the feasibility of diverting water from the Colorado River to the Salt Lake Basin of Utah to help irrigate 450,000 acres, of which 150,000 acres is new land. This is a 25-year development proposal (*13*).

Crop production, including winter feed for livestock, in many areas is principally dependent upon stored or diverted water. Although a large part of all crop acreage is irrigated, the water supplies are inadequate. Use of the undeveloped fertile land in the region is limited, therefore, by the amount of additional water that can be supplied at feasible cost, and by the amount of supplemental water needed for areas that are already irrigated (*20*).

With the exception of a few projects, as the Mountain Home project in southern Idaho and some projects in Colorado and Montana, the more easily developed land has mostly been taken up. Much of the remaining suitable land is in shoestring valleys which are not easily accessible to roads and irrigation canals. To develop these valleys is possible, but a scattered settlement pattern over vast territory would probably mean a high cost for public facilities. A large proportion of the land is in public ownership of one form or another, or in Indian holdings not suited to arable farming. Laws governing water rights are complex and existing rights cannot be transferred readily to other land except that adjacent to the same stream. Much public land is suitable only for grazing (*5*). Apparently, provision of adequate supplies of water must await public reclamation in many instances.

Among new irrigation works is the Colorado-Big Thompson project now being completed in Colorado to divert supplemental water for 600,000 acres in the South Platte Valley north of Denver. This may mean a more intensive use of existing farms.

Two Federal projects were serving about 200,000 acres with irrigation water in the Boise Valley in 1947, and more than 210,000 acres in the Minidoka project in Idaho. Authorized projects would increase the storage-water capacity for both projects so that land could be farmed to capacity. But for the region as a whole, large supplies of water will be needed to supplement water now going to irrigated land and to water new areas.

In Idaho, a recent study made by the Bureau of Agricultural Economics estimated that from 180,000 to 265,000 acres of raw land will be developed for irrigation by 1960, according as we have conditions of moderate to full employment, respectively. Most of this is in the following projects: Mountain Home, Black Canyon, Shoshone, and Minidoka. It is estimated that, in addition to the raw land, 20,000 to 30,000 acres of existing cropland will be irrigated by 1960.

IRRIGATION IMPROVEMENT IN THE PACIFIC STATES

Recent new developments in the Pacific Coast States has resulted primarily in the improvement of present farms.[8] The irrigated harvested cropland and pasture in the Pacific States increased from 5.8 million acres in 1939 to 6.6 million acres in 1944. More than four-fifths of this increase was in California. The Census of Agriculture of 1945 showed an increase of about 900 irrigated farms, but many of these were existing dry farms and ranches not previously irrigated.

As of 1940, 32 percent of the irrigated acreage in the United States was in California, Oregon, and Washington. Much potentially irrigable land remains undeveloped, but development of new farms from not previously farmed land is difficult because of the low rainfall over wide areas, and the need for large volumes of water for irrigation which can be had only when the work is undertaken as large-scale enterprises.

The Central Valley project of the Bureau of Reclamation in the Sacramento and San Joaquin River Valleys in California has supplied supplemental water to much existing farm land, but has not yet made possible the creation of large numbers of entirely new farm units.

Shasta Dam, which regulates the flow of the Sacramento River and stores water for irrigation, has permitted the use for crops of additional irrigable land, and has permitted more intensive use of other land by lessening the hazards of floods. But the addition of new land is as yet not large compared with the acreage scheduled for ultimate development. When additional main canals, irrigation ditches, and diversion dams are provided, large areas can be supplied with water in the Sacramento and San Joaquin Valleys as a result of Shasta Dam and related works.

High prices for crops have given impetus to leveling and the drilling of wells to provide new irrigated cropland in California, but again this has been confined principally to existing farms. In Kern County, about 75,000 acres of irrigated land were developed during the war from dry-farming areas, but only a small part of this was from raw land. The records of the agricultural conservation program for California show that 132,000 acres, some of which were not previously irrigated, were leveled in 1946 on participating farms. These farms were located in 41 counties of the State. This development trend by present operators appears to be continuing, but it does not mean many new farms.

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[8] Washington, Oregon, and California.

A number of sections of land, for example, which had formerly been dry pasture land, have been developed and put into cotton within the last 2 years in the San Joaquin Valley. Financially this development is said to be successful, often paying off the land-development costs within a few years. On the other hand, it is adding to the already heavy drain on the lowering water table.

At the same time new land is being developed, fairly significant shifts are taking place in certain irrigated areas in the West Coast States where land is being absorbed by industrial and housing developments.

Much of the land in the Central Valley is part of existing farms and ranches—either partly irrigated farms and ranches or dry-land farms and grazing operations. Additional water for new irrigation or for supplemental irrigation will allow greater and more efficient production on the present farms, and eventually some increase in number of farms, but the new farming opportunities available to people from outside the region probably will be limited.

The agricultural statistical reports for California as a whole, however, show a large increase in crop acreages in California within recent years. A considerable acreage was made possible by clearing brush and by leveling and irrigating dry grazing and other acreages of only partly improved land.

One of the most promising sources of new land in the Pacific Northwest is that being developed in the Columbia River Basin reclamation project. This project, one of the largest reclamation developments ever undertaken in the United States, is designed to transform more than 1 million acres of dry land in south-central Washington into productive well-watered country capable of supporting a substantial population. Originally it was planned to bring about 50,000 acres a year under irrigation throughout a 20- to 25-year period, but the war retarded the development *(69)*.

Land to be irrigated is scattered over a project area of about 2½ million acres, 50 miles wide and 80 miles long, lying in four counties. It includes both arid and semiarid lands in the Big Bend of the Columbia River.

Public land within the project, scheduled to be available for early settlement, will provide around 700 farm units on 50,000 acres. It is possible that nearly 400,000 acres of private land, or an estimated equivalent of 5,000 farms, can receive irrigation service in a few years *(58)*. The order in which lands will be supplied with water depends principally upon their location with respect to the canal system being constructed.

In Oregon and Washington a recent study of expected changes in agriculture made by the Bureau of Agricultural Economics concluded that by 1960 about 850,000 to 1,100,000 acres of cropland will be added by irrigation, clearing, drainage, and diking if we have conditions of moderate or full employment, respectively. It is estimated that from one-half to two-thirds of the increase in cropland, by 1960, would result from the development of 650,000 to 825,000 acres of raw land. Nearly two-thirds of this increase probably would be in the State of Washington, where more than 80 percent would be in the Columbia Basin project. This, however, will be less than half of the ultimate acreage in the Columbia Basin. Only about 50,000 acres, or a little more than 12 percent, of the acreage expected by 1960 will be on land that now produces wheat under an alternate wheat-fallow system. The rest will be on raw semi-desert-type land.

In other farming districts of Washington, chiefly between the Cascade Mountains and the Columbia River, an additional 70,000 to 90,000 acres of new land probably will be irrigated by 1960. Oregon, it is estimated, will bring about 55,000 to 80,000 acres of raw land under irrigation in the same period.

Some irrigated cropland is to be expected to go out of cultivation as a result of accumulation of alkali, damage by erosion, and the encroachment of urban and industrial developments. Such losses are likely to be balanced by drainage and reclamation of irrigable lands that are now idle because of alkali accumulations or a high water table.

Summary of Irrigation Projects and Proposals

An inventory of Federal reclamation projects shows that projects under construction or authorized in January 1948 contained an estimated 7,098,099 irrigable acres of new land and 3,612,822 acres of supplemental irrigation.

Estimates of the Bureau of Reclamation indicate that eventually as the result of completion of all projects under construction and now authorized, water might be provided for some 70,000 new farms, while development of supplemental water will supply many additional farms. Much of the water probably will go to existing farms now having inadequate water (*57*, *58*).

In many areas the new farms have been estimated to average from 60 to 80 acres of irrigable land; in others there would be a larger irrigable acreage per farm. But, if because of mechanization and other factors tending to promote increases in size of farms, family-sized farms continue to become larger, the number of farms eventually developed will be less than present estimates.

It is recognized that such estimates as are cited, particularly for the larger projects, are based on various types of examinations and investigations and that they may be reduced when necessary structures are installed and the land is actually improved. Detailed surveys of authorized projects are being made on the ground to learn about the arable acreages and the farm lay-outs.

The Land Ownership Survey Report of the Bureau of Reclamation, covering Federal projects that received water in 1946, shows that the total irrigable area was 4,460,767 acres. This land was held in 108,978 ownerships (*67*). The vast majority were found by the survey to be small family-sized holdings. Ninety-seven percent of the ownerships, containing 70 percent of the acreage, had irrigable acres numbering 160 or less, and about 84 percent of the acreage was in ownerships not exceeding 320 irrigable acres. The total irrigable area in projects under construction or authorized for construction in 1946, according to the report, was 2,118,295 acres, held in 33,842 ownerships. Of these ownerships, 6.4 percent, containing 52.7 percent of the irrigable acreage, are larger than 160 acres. Ownership units are not the same as farms, but the size distribution is significant in a study of farming opportunities.

The Census of Irrigation in 1940 shows that all irrigated farms averaged 386 acres and had 72 acres of land irrigated on the average. These averages, of course, include numerous large farms and ranches that have large acreages of dry farming and grazing and many small-to-medium farms consisting chiefly of irrigated land.

Results of recent surveys of irrigation farming in differing sections show that in the grain, sugar-beet, livestock, and general-farming areas, average sizes of farms and of irrigated acreages per farm are fairly large. Frequently the acreage sizes in these areas for irrigated farms are as large as those for nonirrigated farms (*46*).

The Irrigation Census reported considerable acreages in irrigation enterprises in 1940, which the enterprises were capable of supplying with water but not then fully used (*54*). This indicates that it takes considerable time to provide structures and develop the land.

Actual development of new projects will doubtless be slower than the estimates indicate. Influences include appropriations, delays in construction, number of available qualified settlers, presence of land unsuited to irrigation, and sizes of projects.

A study of the Long-Term Outlook for Western Agriculture, by Clawson and Calhoun (*7*), concludes that irrigation of new land and provision of supplemental water for existing farms in the 11 Mountain and Pacific States will be equal in productivity to about 4 million acres of irrigated land by 1960. If the same rate of irrigation development takes place among proposed projects in the six Great Plains States by 1960, there would be the equivalent of an additional one-half million acres irrigated, or a total of 4½ million acres. This acreage, if realized, would equal about 22 percent of the 20.4–million-acres area irrigated in the whole 17 Western States in 1940.

Outlook for New Farms From Irrigation

Except for entirely new-land projects, neither new nor supplemental irrigation will necessarily mean that entirely new irrigated farms will be available for settlement. Many will merely be changed from dry-land farms and ranches to irrigated farms and so will afford few openings for new farmers. Supplemental water will make possible more intensive use of land already farmed.

Farm units on the small reaches of public land in irrigation projects eventually will be open for homesteading, the rate of development to depend upon the amount of construction funds and the availability of materials and manpower. Public notice will be given when the publicly owned lands are ready for homestead entry.

Likewise, some privately owned land within irrigation projects may be bought from the owners. Some of this land will already be developed to some extent, but the buyer will be subject to regulations governing repayment of any remaining public irrigation-construction costs and, of course, must finance future private improvements and pay for the water used for irrigating his land. As water and repayment charges vary greatly from project to project, no adequate over-all estimates for such items can be made. Major construction charges allocated to settlers in some areas amount to $75, or even more than $100, per acre. Furthermore, great variation is to be expected in the costs to individuals of leveling, clearing, and ditching in preparation for irrigation. Costs per acre of land improvement and minimum farm building frequently will be $50 to $100 or more, in addition to the original costs of land and irrigation construction.

Land is for sale in the new project areas as it is in nearly all farming areas. Along the main roads leading across southern Arizona and southern California, for example, there are signs offering privately owned land for sale. Much of it is raw dry land, bare or covered with sagebrush and other desert shrubs (*79*). The price of raw land in many cases requires a large investment for a beginning farmer. Information on land sales and values gathered from land records and farmers by the Bureau of Agricultural Economics show that in numerous instances, in the last few years, undeveloped land in or near irrigation project areas has sold for $50 to $100 per acre. If major construction charges for the project reservoirs and ditches are added, as well as the costs of clearing and leveling the land, and farm improvements, the total investment may exceed $200 per acre. In some cases the total cost for a new farm even may reach $300 an acre.

The high cost of entering farming in the new areas should be emphasized. Many people are thinking of the region as the place for a possible home. It is difficult to start a modern small farm there, as it is elsewhere, with little capital.

Much of the land in the Central Valley, the Columbia Basin, and other large irrigation projects is privately owned and has long been in private hands, and many of these owners wish to develop and farm the land themselves. The whole San Joaquin Valley part of the Central Valley contains nearly 6 million acres of irrigable land, nearly all of which is privately owned and more than 2 million acres of which were already irrigated or partially irrigated before the Central Valley project was undertaken. Irrigated lands are classified as follows: Class 1, the highest type of irrigable land, 28 percent; class 2, land suitable for most crops, 44 percent; pasture, limited in use for crops, 10 percent; other irrigable, 2 percent; alkali lands, 10 percent; and unclassified areas, 6 percent (*66*).

The size of ownerships, extent of improvement, and the intent of the landowners and operators, all affect the availability of land. The general patterns of land ownership in three counties of the Central Valley of California and in the Columbia Basin of Washington illustrate some of the complex problems involved in large areas of land being developed by irrigation.

About 90 percent of the land in the Columbia Basin reclamation project is privately owned, having been homesteaded or bought for dry farming in the latter part of the last century. The remaining 10 percent is publicly owned and, where suitable for farming, or where not needed for public uses, probably will be subject to homesteading when the main irrigation ditches are completed. Individual private holdings range from a few acres to several thousand acres, with railroads and a few other corporations among present landholders.

The Columbia Basin project contains an estimated net irrigable acreage of approximately 1,000,000 acres. Irrigable lands have been classified according to their relative suitability for general crop farming into classes 1, 2, and 3, class 1 being most suitable in all respects. In round numbers, 33 percent of the irrigable acreage was classified as class 1 land, 40 percent class 2, and 27 percent class 3 (*70*).

Under the terms of the Columbia Basin Project Act of March 1943, the land for which one owner may receive water is limited to family-sized farm tracts. The maximum area permitted in any one unit is 160 irrigable acres, although it now seems probable that the average size will not exceed 80 acres. Based on soil type and adaptability, the size of holding is intended to be an economic farm unit. Excess land (above the 160-acre limitation) may be sold by the owner or he may ask the Government to sell it for him. Excess land, if it is to receive water under contract, cannot be sold at more than the Government-appraised value. Nonexcess land may not be sold above the appraised value during the period of development and 5 years from the date water becomes available to the irrigation block in which the land is situated.

The act authorizes the Secretary of the Interior to purchase privately owned excess land—that is, land in excess of 160 acres in one ownership—at the Government-appraised value, to divide it into family-sized economic units, and to resell or lease the land to settlers. More than 200,000 acres of land for sale have been purchased for retransfer to qualified farmers under this authority. But the law provides no authority for the Federal Government to clear or level the land, or for the Department of the Interior to extend financial aid to new settlers, except that required for major irrigation structures (*69*).

According to the report on *Types of Farming* by the Columbia Basin Joint Investigations Committee (*70*), to obtain the net farm income deemed desirable for farm operators will require 50 acres or more of class 1 land, 55 to 80 acres of class 2 land, and at least 160 acres of class 3 land. Slightly larger acreages of class 1 and class 2 land may be allowed per farm in order to provide for effective use of tractors and other machinery. For class 3 land, large units with extensive crops—mostly hay and pasture—offer the most promising means of establishing satisfactory farms.

The productive value per acre for land after it has been improved and brought to full development, but before any of the irrigation construction charges are paid, was estimated by the Types of Farming committee on a prewar price basis as $60 for class 1, $35 to $50 for class 2, and $20 to $30 for class 3. The analysis of farm incomes, earnings, and land values assumed a 1921–40 average level of prices.

Studies of farm development indicated that the cost of preparing land for irrigation will vary greatly among land classes, but usually will be largest on classes 2 and 3, especially where topography is uneven. On most land, leveling can be done by a farmer with farm equipment during off seasons; but it probably will be more economical in the long run to level some of the most uneven places with heavy power equipment. The cost of leveling some tracts may exceed the productive value of the leveled land. The cost of leveling such land might well be averaged over a large acreage much of which would not be expensive to level.

The Vale-Owyhee irrigation project in eastern Oregon, developed during the 1930's, is similar in many respects to other irrigated intermountain areas of the Northwest, and to much of the irrigable area yet to be brought under irrigation in these States (*16*). Settlers on this project have been generally successful, but they experienced many of the hardships commonly associated with settlement on new land.

Settlement was rapid, most of it taking place from 1935 to 1938. In 1944, 1,238 farmers were operating 80,000 acres of irrigated land most of which had been under irrigation less than 10 years. Settlement and development of the project occurred under unusually favorable circumstances. Rising prices for farm products, a location adjacent to a well-developed irrigated area, interested settlers, and availability of technical and financial assistance were all favorable factors which mitigated, but did not remove, all the difficulties of irrigating wild land or developing a new area.

Most settlers came on this project with insufficient funds, and some lacked knowledge concerning irrigation practices and crop requirements for the area. Lack of community services, roads, and other public utilities hindered their progress. But steady economic improvement has been made by the settlers. The area of improved land has increased; net worth, family living, and net income have all improved for most settlers; and housing conditions of many have been improved somewhat. Their experience demonstrates what settlers with few assets at the start can accomplish, on fairly good land under favorable economic conditions, by hard work and careful management of resources.

PROSPECTS FOR ADDITIONAL FARM LAND

Development of new farm land can be expected over the next several years, principally in two major areas. In the lower Mississippi Valley and Coastal Plains of the South, clearing, drainage, and protection from floods and backwater will make possible the development of much private land. In the West, both public and private land will be reclaimed through provision of irrigation water. Other scattered areas over the Nation, if developed, will provide some new farms and considerable additions to present farms. Present use of land, as well as capability for arable farming, varies greatly in different parts of the country (fig. 6).

Irrigation development, curtailed during the war, particularly on the Federal Columbia Basin project, is now beginning anew, and in 2 years should provide many new farms. The number of new farms from such development will probably increase materially in the next 10 years.

For the Western States as a whole, however, individual development of new farms from hitherto nonfarm dry land is difficult. Here the climate is semiarid over large areas, and irrigation projects are possible only when undertaken as large-scale group enterprises.

If public appropriations are continued and if work is carried out in the next few years, it will be possible to create several thousand new farms in the Western States. But as in the Mississippi River Delta, the Southeast, and other areas, there are not many new farm opportunities for additional people from outside. In other words, the number of farm youth and others who wish to farm in each area more than equal the number of existing farms plus the new farms that presumably will become available. With the population increase for the country as a whole, and especially the large gains in the West and South, there will probably be many seekers for new farms and continued development of land on present farms.

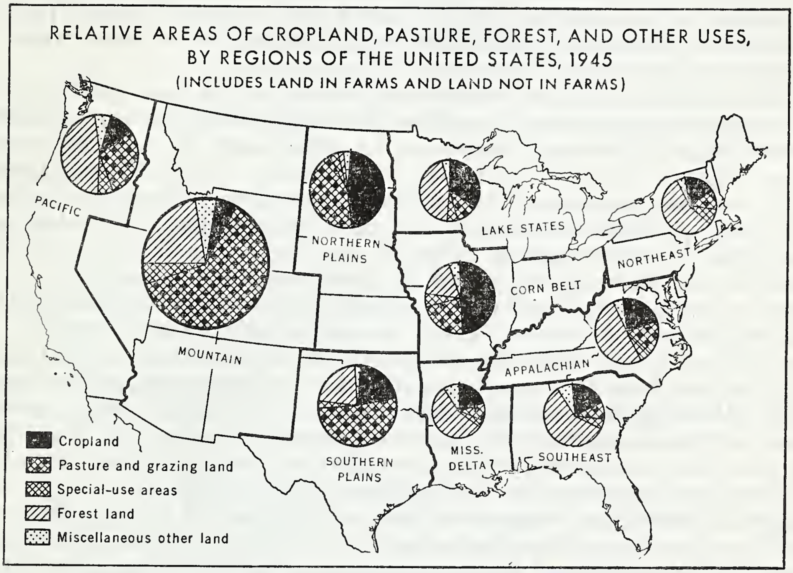

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Figure 6.—The variety of climatic and land conditions in the United States means great differences in area of cropland, pasture, grazing, woodland, and forest as between regions. Grazing land and woodland are inseparable from arable farming over immense areas of the country. Shortage of water, rough topography, or poor soil render large areas more suitable to grazing, woodland, and forest than to cultivation of crops.

In view of this outlook, what are the prospects for agricultural land development in the next few years? What is the character of the land that is suitable for development? Farmers and agricultural technicians know that large areas now in farms could be made more productive by better farm practices. Sizable areas of farm land could be improved by such means as conservation farming, drainage, clearing, and irrigation. Some areas of new land now outside farms could be brought into cultivation. On the whole, however, such improvement would constitute a filling out of the existing farm areas. Local surveys must be made in many instances if the required development is to be successfully planned, and the costs and feasible types of farm production to which suitable undeveloped lands are adapted must be studied.

In this report, estimates of undeveloped land that is suitable for farming have been assembled from many sources. These estimates are not forecasts of development, and they are not recommendations. They merely represent possibilities. Economic surveys to learn the probable returns for much of this land have not been made. It is known that it is physically feasible to develop many areas of new land, but it is not known how economically feasible such development would be for farming. This is a big gap in our knowledge.

Undeveloped land that is suitable for farming can be found for sale in all States. If a buyer is willing to make the necessary expenditures in money, effort, and time, to locate, buy, and reclaim it, and if public assistance for major reclamation works for service of wide areas is forthcoming, much of it can eventually be farmed.

On the whole, the new irrigation projects in the West would seem to be promising at present for those who want undeveloped land where family-sized farms and homes can be established, but, as explained, these opportunities will be limited in number and available only gradually over an extended period. Even so, irrigation projects are further advanced toward completion than new land-drainage and clearing activities in other regions. People who live in the Western States will have a better chance to find the good land than those from a distance. Veterans have priority in applications for new irrigated farms on publicly owned land. There are many applicants for farms.

Creation of new farms in many areas and enlargement of old ones will depend heavily upon the construction of area-wide public projects—drainage, flood control, and irrigation. Retrenchment or deferment of public expenditures for these purposes, or notable scarcities in materials, machinery, or labor would affect the development greatly.

Drainage programs in the Southern States still have a long way to go in providing integration and enlargement of present projects and in financing and constructing new drainage works, before remaining large areas of fertile land can be fully developed for farm use. When all this is done, substantial increases can be made in the present low cropland base per farm, and new farms can be created for some of the people in overpopulated parts of the South. No one knows how much or how rapidly these poorly drained areas will be developed. Demands of farm people for homes and incomes will almost surely bring increases in drainage and clearing of suitable lands in the South and East during the next two decades. Such development probably would add 10 percent to the cropland and improved pasture land in the region. Moreover, it would help to bring crop diversification and would permit needed conservation practices that are now difficult because of the small acreage per person and per farm. The development of this land might be partly offset by the abandonment of other land.

Much land in the South that can be developed by clearing and drainage is better adapted to general farm crops and improved pastures than to cotton and tobacco. The best undeveloped land is bottomland along the streams in the Southeast and in the lower Mississippi Valley. Many of the lowlands are generally believed by farmers and by technicians to be more suitable for corn, oats, hay, and pasture, than for cotton. Some lowland also is adapted to rice, potato, and truck crops. The central Mississippi River Delta is the principal place where increase in cotton acreage is most likely to occur as a result of new drainage and clearing. Possible new-land development by irrigation in the West, likewise, may add to the cash-crop acreages of cotton, sugar beets, and potatoes. Nearly all parts of the country need land improvement to enlarge small farms that have too few acres of productive crops and pasture, as well as to provide farms for young people who wish to farm.

Moderate reaches of privately owned woodland suitable for crops, without major drainage, are to be found scattered in parts of the Southern, Eastern, and North Central States. Larger potential farm areas that require drainage, clearing, and protection from floods, are to be found in the Southern Coastal Plains and the lower Mississippi Valley. Some of this land is owned by farmers, lumber companies, and other landholders, who may be willing to sell family-sized tracts. Still other large and as yet undeveloped or partially developed areas in the West may be bought from public or private owners and can be farmed, after it is cleared, drained or irrigated, and otherwise improved.

Much undeveloped land that is for sale in scattered tracts over the country is not all suitable for agricultural use because of poor soil, location, or other limitations. The unwary may be tempted to make unwise purchases of some of it because of exaggerated advertising. Sales promotion by means of such slogans as, "Three Acres and Independence," "Farms, Forty Acres, One Dollar Down," and others that stress healthful climate, possibility of producing some unusual crop, low price, or recreational advantages, are not uncommon. Careful investigation may reveal some promising undeveloped farm sites, but it may also reveal that, in general, many tracts can never be made into successful farms.

Land prices are high at present but considerable numbers of small, undeveloped and partly developed farm tracts are being bought in several parts of the country. As yet, land development is proceeding in most areas at a rate lower than what was considered normal in the 20 years 1920–40. Reasons include nonfarm work at good wages, increased efficiency in production on existing cropland, and scarcity of building materials, farm tools, and machinery.

One of the biggest problems in new-land development is whether there is real need for making more land available for crops to send to market. With advancing farm technology the country may be able to get along with the same or even less cropland, and with fewer farms than at present, and yet adequately supply commercial requirements for agricultural products both at home and abroad. The cold-blooded business concept of fewer and more efficient farms would have to be reconciled with the need and desire of people on the land for farm homes and for production for family and local use—both now and in the future. Factors of regional and area balance and of development to offset retirement of land are additional considerations favorable to an active program of land development and improvement, over the next several years. The question of how far the country should go in fostering large-scale additional land development may be answered through studies of prospective demands for the products of additional farms. The fact that the rate of land development is slower now than formerly may indicate that the need is less.

These observations pose a problem that perhaps belongs in a more comprehensive treatment of the subject of food and land requirements rather than in this report. The outlook for farming, including the prospective demands for specific farm products and expected income compared with costs, is a subject to which careful study could be given to good advantage by individuals who undertake the development of new farms as well as by groups that are considering new community, district, and regional land-reclamation projects.

It seems reasonable that public funds should be used to develop new land only when there is a well-recognized public need for the land. Individuals would be free at all times to investigate and undertake private land development that they believe will lead to profit for themselves and worth-while employment of unused resources.

Other factors which frequently are not taken into account sufficiently in estimates of new farm land are: The time that must elapse in making appropriations for necessary public works, letting contracts, actual construction, farm development including selection of farms and the working out of business arrangements by individual farmers. Land development also has large demands for farm labor, material, equipment, and funds for expenses until the farm is a going concern.

Demand for new farms varies to some extent with employment conditions. With full employment there is less demand for new farms than when there is unemployment. On the other hand, when there is full employment and the demand is heavy for farm products, there is more inducement to commercial farmers to develop new land than when there is a slackening market. Accordingly, it now appears that there will be continued interest in new land development over the next few years, especially by established farmers who want to expand their farms.

If the public projects now under way are continued and if authorized work is carried out, and labor and materials are available in normal amounts for land improvement by individual farmers, new farm-land development likely to get started during the next 10 years looks about like this:

	Acres
New land which probably can be developed by drainage and by clearing if authorized drainage and flood-control construction is continued	8,000,000
Land for which it is anticipated new irrigation service could be provided and developed for farming if construction is carried forward on authorized projects	4,500,000
Estimated new farm-land development in 10 years	12,500,000

Much of the private land that will be developed will not be available for new farms, for probable half or more of the expected development will be on existing farms. If half of the development leads to new farms with an average of 100 acres, there would be land enough for approximately 50,000 to 60,000 full-time family-sized farms.

These may appear to be probable new acreages when compared with recent prewar experiences; others may give estimates of quite different figures as more likely to occur. But anyone who is familiar with new-land development by clearing, drainage, and irrigation is likely to concede that development may be expected to continue—the actual rate depending upon such factors as need for land to round out existing farms, demand for farm products, the costs, and the construction of public improvements and facilities to serve lands now undeveloped.

New-land development will not all result in a net increase in improved farm acreage. Much farm land will continue to be shifted to other uses, which include residential and industrial uses, and public purposes—protection of water supplies and watersheds, sites for flood-control and power reservoirs, and the building of air fields. In many Eastern States new land clearing and drainage probably will about balance the abandonment of poor farm land and the reversion to forest.

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